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INSTRUCTION MANUAL

REGULATED POWER SUPPLIES

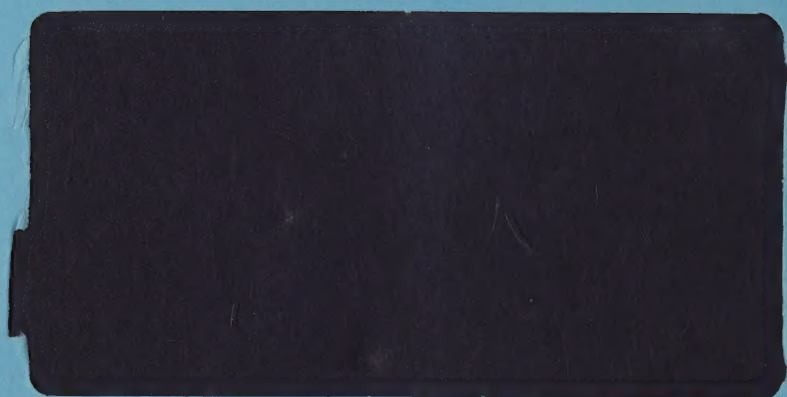
MODEL LM
D PACKAGE

THIS MANUAL APPLIES TO UNITS
BEARING SERIAL NO. PREFIXES A-E



LAMBDA

LAMBDA ELECTRONICS CORP.-MELVILLE, L. I., N. Y.



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FOR
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This manual provides instructions intended for the operation of Lambda power supplies, and is not to be reproduced without the written consent of Lambda Electronics Corp.

LAMBDA ELECTRONICS CORP.

MELVILLE, L. I., N. Y.

MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

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SPECIFICATIONS AND FEATURES

The following specifications apply for all Lambda D package LM power supplies. Specification exceptions noted here relate to models incorporating model option "Y" and/or "T". Performance specifications do not change for models with suffix "R", e.g., LM-D2-R unless the models also include model options "Y" and/or "T" e.g., LM-D2-YR; for these models the appropriate specification exceptions also apply.

NOTE: Specifications in *italics* apply only for Lambda models with a "Y" suffix, e.g., LM-D2-Y. AC INPUT specification with an asterisk *, applies only for Lambda models with a "T" or "V" suffix, e.g., LM-D2-YT.

DC OUTPUT--Voltage regulated for line and load

Voltage Range... For voltage range see table I of pertinent model group.

Multi-Current Ratings... Current ratings specified for each maximum ambient temperature apply over entire output voltage range, with input frequency 55-65 cps. For input frequencies 45-55 at 105-132 VAC, 200-250 VAC, or 205-265 VAC, 40° current rating does not apply. For input frequencies 360-440 cps, consult factory for current ratings. For maximum current ratings at each ambient temperature see table I of pertinent model group.

REGULATED VOLTAGE OUTPUT

Regulation (line)... Less than 0.05 percent plus 4.0 millivolts for input variations from 105-132 or 132-105 volts AC
... *Less than 0.01 percent plus 1.0 millivolt for input variations from 105-132 or 132-105 volts AC*

Regulation (load)... Less than 0.03 percent plus 3.0 millivolts for load variations from 0 to full load or full load to 0
... *Less than 0.02 percent plus 2.0 millivolts for load variations from 0 to full load or full load to 0*

Remote Programming

External Resistor... Nominal 200 ohms/volt output

Programming Voltage... One-to-one voltage change

Ripple and Noise... One millivolt rms; 3 millivolts peak-to-peak
... *0.5 millivolt rms; 1.5 millivolts peak-to-peak with 60 cps input*

Temperature Coefficient... Change in output voltage less than 0.03%/°C
... *Change in output voltage less than 0.01%/°C*

AC INPUT--105-132 volts AC at 45-440 cps; 300 watts+
+ With output loaded to full 40°C rating and input voltage 132 volts at 55-65 cps.
*... 200-250 volts AC at 45-440 cps ("T" option)
*... 205-265 volts AC at 45-440 cps ("V" option)

INPUT FUSE--"SLO-BLO" fuse F1 protects the AC input circuit. Overload of the supply does not cause fuse failure.

For fuse ratings see table I of pertinent model group.

OVERLOAD PROTECTION

Thermal... Thermostat resets automatically when overtemperature condition is eliminated

Electrical... Within rated voltage range, an automatic electronic current-limiting circuit limits output current to approximately 110 percent of 40°C rated current for protection of load and power supply; for overloads approaching short circuit, both voltage and current decrease until at short circuit, current is approximately 30 percent or less of rated current, except for models LM-234, LMD-0-14, 0-32, and 0-60 where output current remains limited to 110 percent of 40°C rated current at 40°C ambient.

OVERSHOOT--No overshoot of output voltage under conditions of power turn-on, power turn-off, or power failure.

INPUT AND OUTPUT CONNECTIONS--Heavy duty terminal block on rear of chassis

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE--Continuous duty from -20°C to 71°C ambient with corresponding load current ratings for all modes of operation, and all mounting positions.

STORAGE TEMPERATURE-- -55°C to +85°C

CONTROLS

DC output control... Voltage adjust control permits adjustment of DC output voltage via access hole located in nameplate.

REMOTE SENSING--Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation.

PHYSICAL DATA

Size.....4-15/16" H x 7-1/2" W x 9-3/8" D

Weight 20 lbs. net; 23 lbs. shipping wt.

Finish Grey, FED STD 595 No. 26081

MOUNTING--Three surfaces, each with tapped mounting holes, can be utilized for mounting this unit. Refer to figure 9 for mounting details.

ACCESSORIES

Rack Adapters... Rack adapters LRA-4 and LRA-6, used for ruggedized mounting, with or without chassis slides, are available, as well as rack adapters LRA-3 and LRA-5 which are used for simple rack installations where chassis slides are not required.

Metered and Non-Metered Panels... Metered panels MP-3, MP-5 and Non-Metered panels P-3, P-5 are available for use with the Lambda rack adapters.

Blank Panels... Full-rack, half-rack and quarter-rack panels can be used with the Lambda rack adapters. The following chart lists the panels and rack adapters that can be utilized together.

Rack Adapter	BLANK PANELS			Metered/Non Metered Panel
	1/2 Rack	1/4 Rack	Full Rack	
LRA 3	LBP-20	LBP-10	LBP-40	MP-5, P-5
LRA 6	LBP-20	LBP-10	LBP-40	MP-5, P-5
LRA 4	LBP-50	LBP-60	LBP-30	MP-3, P-3
LRA 5	LBP-50	LBP-60	LBP-30	MP-3, P-3

Overvoltage Protector... Externally mounted, Overvoltage Protectors LMOV-1, LMOV-2 and LMOV-3 are available for use with Lambda LM power supplies.

MODEL OPTIONS

Suffix "T" Input Option... Standard LM power supplies are available for operation with 200-250 volt, 45-440 cps input.

Suffix "Y" High Performance Option... All Lambda LM power supplies are available with high performance specifications. See italicized entries under SPECIFICATIONS AND FEATURES.

Suffix "R" Fungus Proofing Option... Standard LM power supplies can be obtained with fungus proofing treatment with MIL V 173 varnish for all fungi nutrient components.

Suffix "V" Input Option... Standard LM power supplies are available for operation with 205-265 volt, 45-440 cps input.

THEORY OF OPERATION

GENERAL

The Lambda power supply consists of an AC input circuit and transformer; a bias supply consisting of an auxiliary rectifier, filter, and a zener diode regulator; and a main regulator circuit consisting of the main rectifier and filter, a series regulator, emitter follower drivers, an error amplifier, a current limit amplifier, an output voltage sensing circuit and an output current sensing circuit. In addition, certain models also contain a current sink circuit or a voltage amplifier circuit.

The circuit arrangement is shown in block diagram form in figure 7. The circuitry is discussed with reference to the block diagram and the schematic diagram.

FUNCTIONAL DESCRIPTION

Single phase input power is applied to transformer T1 through the input circuit containing thermostat S1, which protects the supply against overheating.

The main rectifier, a full-wave rectifier, provides the power which is filtered by capacitor C8 and then regulated via a series regulator and delivered to the output. Bias supply, half-wave, auxiliary rectifier CR7, provides voltage filtered by capacitor C7 and regulated by zener diode CR6 for current limit amplifier Q3 and error amplifier Q1, Q2 (or, as applicable, for voltage amplifier Q2). Zener diode CR1 and resistor R5, across the bias supply, provide a regulated temperature compensated reference voltage. Resistor R4 compensates for input voltage variations.

Operation of the voltage regulator circuit is determined by changes in the output voltage. A change in the output voltage is sensed by the sensing divider resistors which compare output voltage with the +S reference voltage. This provides an error voltage at junction of R2 and R3 (or, as applicable, R1 and R3) which is amplified by error amplifier Q1, and Q2 (and as applicable, by voltage amplifier Q2), and is current amplified by drivers Q5, Q6 (and, as applicable, by Q8, Q9). The amplified signal from the drivers controls the voltage across series regulator Q8-Q13 (or, as applicable, Q10-13), which functions as the active regulating element, restoring output voltage to the proper level.

*Current limit circuit operation is determined by changes in the load. Current limit amplifier Q3 samples load current through current sensing resistor R25. When the voltage drop across R25 increases compared with the preset voltage reference determined by R17 and R18, (and CR4 and Q4 where applicable), Q3 conducts. Thus, when the output current rating of the unit is exceeded, current limit amplifier Q3 conducts decreasing the current through drivers Q5, Q6, (and, as applicable by Q8, Q9) resulting in an increase of voltage across the series regulator and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by the factory setting of current limit potentiometer R17.

+When operating conditions approach short circuit, the output voltage decreases. Since the voltage determined by R17 and R18 is proportional to the output voltage, when the output voltage decreases, Q3 is biased into turn-on at lower and lower load currents until output voltage decreases to zero and current decreases to a predetermined low value.

+The following theory only applies for units with current sink Q4.

When operating conditions approach short circuit, and output voltage value decreases below the minimum voltage rating, current sink Q4 saturates and the divider R17, R18, Q4, R19 becomes purely resistive with no regulated reference for current limit operation. With Q4 in saturation the voltage reference becomes proportional to the output voltage, i. e., decreases as the output voltage decreases. This permits Q3 to turn on at lower and lower load currents until output voltage decreases to zero and current decreases to a predetermined low value.

*The following theory only applies for units with voltage amplifier Q2.

Current limit circuit operation is determined by changes in the load. When load current increases above the rated current value, the voltage drop across current limit potentiometer R17 increases, turning on current limit amplifier Q3. With Q3 conducting, the current to driver Q5 decreases, limiting the base current to series regulator Q8-Q13, which results in an increase of voltage across the series regulator and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by the factory setting of current limit potentiometer R17.

When operating conditions reach short circuit, the output voltage value decreases to zero and the current decreases to a predetermined current limit value and remains unchanged.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 40°C. For continuous operation, load current must not exceed the rating for each ambient temperature. *When load current exceeds 110% of 40°C rating, both voltage and current decrease until voltage reaches zero and the current at short circuit equals approximately 30 percent or less of the rated current.

*For models LM 234, LMD-0-14, LMD-0-32, LMD-0-60 output current remains limited to 110% of 40°C current rating.

MOUNTING

When using this unit as a mounted component, a cutout must be provided to permit free-flow of air through the unit. See figure 9 for cutout sizes and specific mounting details.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying AC input power.

Ground Connections. The Lambda power supply can be operated either with negative or positive output terminal grounded. Both positive and negative ground connections are shown in the diagrams for all suggested output connections illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminal block on the rear of the supply. Apply input power to terminals 1 and 2; always connect the ungrounded (hot) lead to terminal 1.

The supply positive terminal is brought out to terminal 6; the negative terminal to terminal 4.

NOTE: When shipped from the factory, the supply is ready for use as a local-sensing constant voltage source. Jumpers are connected at the factory as shown in figure 3. Take care to remove the appropriate jumpers for load requirements that need different supply-load connections. Refer to the appropriate connection diagram.

Supply-Load Connections. The regulation of the supply at the load may change when connecting leads of practical length are used. To minimize the effect of the output load leads, remote sensing is used. Refer to figure 1 to determine voltage drop for particular cable lengths, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Local-Sensing Connection, See Figure 3.

Remote-Sensing Connection, See Figure 4.

Programmed Voltage Connection Using External Resistor, See Figure 5. Discrete voltage steps can be programmed with a resistance voltage divider valued at nominal 200 ohms/volt output and a shorting-type switch. For continuous voltage variations, use a variable resistor with the same ohms/volt ratio in place of the voltage divider and shorting-type switch. Use low temperature co-efficient resistor(s) to assure most stable operation.

Programmed Voltage Connection Using Programming Voltage, See Figure 6. The power supply voltage output can be programmed with an externally connected programming power supply. The output voltage of the programmed supply will maintain a one-to-one ratio with the voltage of the programming supply.

The programming supply must have a reverse current capability of 6 ma. minimum.

Alternatively, when supplies with less than 6 ma. reverse current capability are used, a resistor capable of drawing 6 ma. at the minimum programming voltage must be connected across the output terminals of the supply. This programming supply must be rated to handle all excess resistor current at the maximum programming voltage.

Operation After Thermostat Shutdown. The thermostat opens the input circuit only when the power supply output current exceeds the current rating specified for the operating ambient temperature, causing the unit to overheat. Do not exceed current rating specified for the operating ambient temperature. When the temperature of the unit decreases to a safe operating value, the thermostat will reset automatically.

Operation After Fuse Shutdown. Internal component failure is prevented by fuses which protect the components from damage caused by excessive currents. Fuses will blow when the maximum rated current value for the fuse is exceeded. Fatigue failure of fuses can occur when mechanical vibrations from the installation combine with thermally induced stresses to weaken the fuse metal. Many fuse failures are caused by a temporary condition and replacing the blown fuse will make the fuse protected circuit operative.

MAINTENANCE

GENERAL

This section describes trouble analysis routine, calibration and test procedures that are useful for servicing the Lambda power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on specifications and features for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check all fuses, primary power lines, external circuit elements, and external wiring for malfunction before trouble shooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumpers and supply-load connections or fuse failure due to metal fatigue.

Use the electrical schematic diagram and block diagram, figure 7, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal no load operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistors with an in-circuit transistor checker. If no checker is available, transistors can be checked with an ohmmeter that has a highly limited current capability. Observe proper polarity for PNP or NPN to avoid error in measurement. The forward transistor resistance is low but never ZERO; backward resistance is always higher than the forward resistance.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on, before checking for additional faulty components could damage the replaced component.

When soldering semi-conductor devices, hold the lead being soldered with a pair of pliers or a commercial heat sink device placed between the component and the solder joint.

NOTE: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values. Only a dead short is a true indication of a shorted capacitor.

PRINTED CIRCUIT BOARD MAINTENANCE TECHNIQUES

1. If foil is intact but not covered with solder it is a good contact. Do not attempt to cover with solder.
2. Voltage measurements can be made from either side of the board. Use a needle-point probe to penetrate to the wiring whenever a protective coating is used on the wiring. A brass probe can be soldered to an alligator clip adapted to measuring instrument.
3. Always use a heat sink when soldering transistors; a transistor pad with mounting feet is an effective heat sink.
4. Broken or damaged printed wiring is usually the result of an imperfection, strain or careless soldering. To repair small breaks, tin a short piece of hook-up wire to bridge

the break, and holding the wire in place, flow solder along the length of wire so that it becomes part of the circuitry.

5. When unsoldering components from the board never pry or force loose the part; unsolder the component by using the wicking process described below:
 - (a) Select a 3/16 inch tinned copper braid for use as a wick; if braid is not available, select AWG No. 14 or No. 16 stranded wire with 1/2 inch insulation removed.
 - (b) Dip the wick in liquid rosin flux.
 - (c) Place the wick onto the soldered connection and apply soldering iron onto the wick.
 - (d) When sufficient amount of solder flows onto the wick, freeing the component, simultaneously remove iron and wick.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes, and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

- (a) AC power of proper voltage and frequency is present at input terminals.
- (b) Either positive or negative terminal is connected to chassis ground.
- (c) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

TROUBLE CHART

<u>Symptom</u>	<u>Probable Cause</u>	<u>Remedy</u>
1. No output voltage	No power input, thermostat S1 open	Check power source, S1, line cord and line cord plug; shut off unit, allow to cool and check ambient temperature
	Improper output terminal connection	Refer to appropriate connection diagram, and check for correct connections
	Faulty Q2, CR1, CR6 (or Q3 for Zero Volt Units)	Check Q2, CR1, CR6 (or Q3) for short and replace as required
2. Unable to adjust output voltage	Damaged VOLTAGE ADJUST control	Check R1 for shorts and/or open; replace as required
	Supply operating as constant current source at current limit value	Remove load, check load value and check for shorts and/or improper supply-load connections; refer to appropriate diagram for correct connections
3. Output voltage too high	Improper output terminal connection	Refer to appropriate connection diagram, and check for correct connections

TROUBLE CHART (Cont'd)

<u>Symptom</u>	<u>Probable Cause</u>	<u>Remedy</u>
3. (Cont'd)	Faulty Q1, R1, Q8-Q13, (or Q10-Q13 as appl.) Q5, Q6 (and Q8, Q9 as appl.) or CR1	Check R1 for open; Q8-Q13, (or Q10-Q13) Q5, Q6, (and Q8, Q9), Q1 for short; CR1 for open and replace as required.
4. Output voltage too low	Load resistance improper for unit ratings Faulty Q2, Q3, R25, R17 (or CR4 where used)	Check load resistance value Check Q2, Q3 (or CR4) for short, R25, R17 for open, replace as required
5. High ripple and unregulated DC output	Load resistance improper for unit ratings	Check load resistance value
6. This step only for units with current sink Q4. Current limit value improper and varies directly with output voltage	Faulty Q4	Check Q4 for short and replace as required
7. High ripple	Improper ground	Connect terminal 6 or terminal 4 to ground terminal 5

PREFORMANCE CHECK

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 8. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

Set the differential meter, DC VTVM (John Fluke Model 825A or equivalent) to the selected power supply operating voltage. Check the power supply load regulation accuracy while switching from the full load to no-load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105-132 or 132-105 volts AC and check the power supply line regulation accuracy on the VTVM differential meter.

Use a VTVM, Ballantine 320 or equivalent, to measure rms ripple voltage of the power supply DC output. Use oscilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

ADJUSTMENT OF CALIBRATION CONTROL R17

Whenever Q3, R25* or R17*(and Q4, CR4 where used) are replaced, and voltage and current indications do not reflect maximum ratings, adjust R17 as follows:

* For model LM234, LMD-0-14, LMD-0-32, LMD-0-60, adjustment is required only when R17 or R25 is replaced. The adjustment procedure requires that the power supply is removed from associated equipment, is at ambient temperature of 25-30°C, and is stabilized and not operating.

1. Remove AC power input to the supply.
2. Unsolder wiper of R17 from resistor housing and turn to full CW position.
3. Operate power supply for constant voltage with local sensing, connected as shown in figure 3, with no external load.
- 4.** Turn voltage adjust control until minimum rated output voltage is obtained.
- 5.** Apply load so that output current is 110% of 40°C rating for the unit.
- 6.** Using an oscilloscope, Tektronix 503 or equivalent, observe output voltage while adjusting R17 in a CCW direction. Adjust R17 until output ripple increases sharply and oscilloscope pattern changes.
- 7.** After adjustment is completed, remove AC power input to the supply and solder wiper of R17 to resistor housing.
- 8.** After soldering, check setting and repeat adjustment procedure if required.
- ** Perform alternate steps 4A through 9A for adjustment of R17 on models LM234, LMD-0-14, LMD-0-32 and LMD-0-60.
- 4A. Turn voltage adjust control until rated output voltage is obtained.
- 5A. Apply load so that output current is 130% of 40°C rating for the unit.
- 6A. Using an oscilloscope, Tektronix 503 or equivalent, observe unit output voltage while adjusting R17 in a CCW direction. Adjust R17 until output ripple increases sharply and oscilloscope pattern changes.
- 7A. Place a DC ammeter of appropriate scale across output terminals 4 and 6 of the supply. The meter indication shall be a maximum of 133% of 40°C rating for the unit.
- 8A. After adjustment is completed, remove AC power input to the supply and solder wiper of R17 to resistor housing.
- 9A. After soldering, check setting and repeat adjustment procedure if required.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest office of the Lambda Electronics Corp. where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt of this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used in Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.
2. Lambda part number.
3. Description of part together with circuit designation.
4. If part is not an electronic part, or is not listed, provide a description, function, and location of the part.

PARTS LIST

The electrical parts located on all LM-D models are listed here. Parts common to a group of LM-D models are listed first. Unique parts of individual models within the group are listed separately, by model, immediately following the group common-parts listing. In addition there are separate listings of parts for the metered panel (MP) option, the Y option and the overvoltage protection (OV) option, as applicable, for all LM-D models. The parts listed for model LM-234 do not utilize the common parts - unique parts listings; all the parts for this model are sequentially listed under the heading "PARTS FOR MODEL LM234". Parts for the "T" option, "R" option and "V" option are included at the ending of this listing.

MODELS LM-235 — LM-238

COMMON PARTS

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006	\$.27
C2	Cap., mylar, 100 mfd ±10%, 28 vdc	CGM-22-003	.33
C4	Cap., elect., 3.0 mfd -10 + 75%, 100 vdc	CBN-30-015	1.58
C5	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002	.36
C7*	Cap., elect., 140 mfd -10 + 100%, 30 vdc	CBR-14-030	1.58
C9	Cap. mylar, 0.1 mfd ±10%, 200 vdc	CAM-10-012	.65
C11	Not assigned		
C12+	Cap., mylar, .001 mfd ±10%, 200 vdc	CGK-10-004	.21
CR1*	Rectifier, zener diode	FBM-Z104	4.35
CR2	Rectifier	FBL-00-030	1.40
CR3	Same as CR2		
CR4	Rectifier, zener diode	FBM-Z102	2.75
CR5	Same as CR2		
CR6	Rectifier, zener diode	FBM-Z103	4.87
CR7	Same as CR2		
F1	Fuse, 7 amperes, 3 AG, "SLO-BLO"	FFC-07-000	.21
Q1	Transistor, NPN	FBN-L110	3.25
Q2	Same as Q1		
Q3	Same as Q1		
Q7	Not assigned		
R3	Res., ww, 1,200 ohms ±3%, 2 w	DFS-12-030	.90
R4*	Res., film, 15,000 ohms ±2%, 1/2 w	DCT-15-013	.30
R5	Res., film, 220 ohms ±2%, 1/2 w	DCR-22-005	.30
R6	Res., comp., 180,000 ohms ±10%, 1/2 w	DEB-1841	.12
R7	Res., film, 3,900 ohms ±5%, 1/2 w	DCS-39-014	.25
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721	.12
R9	Res., comp., 150 ohms ±10%, 1/4 w	DCB-1511	.10
R10	Res., comp., 3,900 ohms ±10%, 1/2 w	DEB-3921	.12
R11	Res., comp., 22,000 ohms ±10%, 1/2 w	DEB-2231	.12
R12	Res., comp., 47 ohms ±10%, 1/2 w	DEB-4701	.12
R13*	Res., ww, 600 ohms ±3%, 3 w	DFR-60-005	.89

MODELS LM-235 — LM-238 (Cont)

COMMON PARTS (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R14,	Not assigned		\$
R15			
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2 w	DNS-12-026	1.25
R18	Res., film, 2,000 ohms ±5%, 1/2 w	DCS-20-018	.25
R22	Res., comp., 1,200 ohms ±10%, 1/2 w	DEB-1221	.12
R23	Res., comp., 22 ohms ±10%, 1/2 w	DEB-2201	.12
S1	Thermostat	FKA-142-015	5.00
XF1	Fuseholder	HRM-00-009	.20

⁺ This part not used on units with serial no. prefixes A,B

*This part not used on units with "Y" option

UNIQUE PARTS

MODEL LM-235

C3	Cap., elect., 3,200 mfd -10 +100%, 28 vdc	CBS-32-027	2.31
C6	Cap., mylar, 0.0068 mfd ±10%, 200 vdc	CGK-68-001	.34
C8	Cap., elect., 15,700 mfd -10 + 100%, 20 vdc	CBT-16-010	10.28
C10	Cap., mylar, 0.1 mfd ±10%, 200 vdc	CAM-10-012	.65
CR8	Rectifier	FBL-00-054 or FBL-00-046	1.35 1.25
CR9	Not assigned		
CR10	Same as CR8		
Q4	Transistor, PNP	FBN-L103	4.87
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN-36486	2.75
Q8 thru Q13	Transistor, NPN	FBN-36485	4.13
R1	Res., var., ww, 2,200 ohms ±5%, 5 w	DNS-22-029 or DNS-22-056	1.75 2.50
R2	Res., ww, 1,200 ohms ±3%, 2 w	DFS-12-030	.90
R16	Res., comp., 1,200 ohms ±10%, 1/2 w	DEB-1221	.12
R19	Res., film, 1,000 ohms ±5%, 1/2 w	DCS-10-019	.25
R20	Res., comp., 15,000 ohms ±10%, 1/2 w	DEB-1531	.12

UNIQUE PARTS (Cont)

MODEL LM-235 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R21	Res., film, 1,800 ohms ±5%, 1/2 w	DCS-18-013	\$.25
R24	Res., comp., 1,500 ohms ±10%, 2 w	DHB-1521	.24
R25 thru R30	Res., ww, 1.0 ohms ±3%, 3 w	DFN-10-041	.66
T1	Transformer	ABA-235	34.00

MODEL LM-236

C3	Cap., elect., 600 mfd -10 + 100%, 75 vdc	CBR-60-022	3.67
C6	Cap., mylar, 0.0033 mfd ±10%, 200 vdc	CGK-33-003	.33
C8	Cap., elect., 9000 mfd -10 + 100%, 45 vdc	CBS-90-021	12.28
C10	Not assigned		
CR8	Rectifier	FBL-00-054 or FBL-00-046	1.35 1.25
CR9	Not assigned		
CR10	Same as CR8		
Q4	Transistor, PNP	FBN-L103	4.87
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN-35469	4.29
Q8- Q13	Transistor, NPN	FBN-36220	6.60
R1	Res., var., ww, 4,500 ohms ±5%, 5 w	DNS-45-030 or DNS-45-050	2.38 2.50
R2	Res., ww, 2,000 ohms ±3%, 3 w	DFS-20-032	.87
R16	Res., comp., 1,800 ohms ±10%, 1/2 w	DEB-1821	.12
R19	Res., film, 2,700 ohms ±5%, 1/2 w	DCS-27-020	.25
R20	Res., comp., 47,000 ohms ±10%, 1/2 w	DEB-4731	.12
R21	Res., film, 2,400 ohms ±5%, 1/2 w	DCS-24-001	.25
R24	Res., comp., 1,500 ohms ±10%, 2 w	DHB-1521	.24
R25 thru R30	Res., ww, 1.5 ohms ±3%, 3 w	DFN-15-042	.60
T1	Transformer	ABA-236	34.00

MODEL LM-237

C3	Cap., elect., 600 mfd -10 + 100%, 75 vdc	CBR-60-022	3.67
C6	Cap., mylar, 0.0068 mfd ±10%, 200 vdc	CGK-68-001	.34
C8	Cap., elect., 8,400 mfd -10 + 100%, 60 vdc	CBS-84-036	8.18
C10	Not assigned		
CR8	Rectifier	FBL-00-054 or FBL-00-049	1.35 1.15
CR11			
Q4	Transistor, PNP	FBN-L103	4.87
Q5	Transistor, NPN	FBN-L108	2.25
Q6	Transistor, NPN	FBN-36488	3.75
Q8	Transistor, NPN	FBN-36487	5.63
thru Q13			
R1	Res., var., ww, 4,500 ohms ±5%, 5 w	DNS-45-030 or DNS-45-050	2.38 2.50
R2	Res., ww, 3,000 ohms ±3%, 3 w	DFS-30-021	.62
R16	Res., comp., 2,200 ohms ±10%, 1/2 w	DEB-2221	.12

UNIQUE PARTS (Cont)

MODEL LM-237 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R19	Res., film, 6,800 ohms ±5%, 1/2 w	DCS-68-021	\$.25
R20	Res., comp., 120,000 ohms ±10%, 1/2 w	DEB-1241	.12
R21	Res., film, 4,700 ohms ±5%, 1/2 w	DCS-47-003	.25
R24	Res., comp., 3,300 ohms ±10%, 2 w	DHB-3321	.13
R25 thru R30	Res., ww, 1.5 ohms ±3%, 3 w	DFN-15-042	.60
T1	Transformer	ABA-237	34.00

MODEL LM-238

C3	Cap., elect., 520 mfd -10 + 100%, 100 vdc	CBR-52-025	2.75
C6	Cap., mylar, 0.0033 mfd ±10%, 200 vdc	CGK-33-003	.33
C8	Cap., elect., 3,100 mfd -10 + 100%, 110 vdc	CBS-31-024	11.97
CR8	Rectifier	FBL-00-054	1.35
thru CR11			
Q4	Transistor, PNP	FBN-L107	6.85
Q5	Transistor, NPN	FBN-L108	2.25
Q6	Transistor, NPN	FBN-35903	5.17
Q8	Transistor, NPN	FBN-35902	9.90
thru Q13			
R1	Res., var., ww, 9,000 ohms ±5%, 5 w	DNS-90-031 or DNS-90-058	2.38 2.50
R2	Res., ww, 4,500 ohms ±3%, 3 w	DFS-45-044	.87
R16	Res., comp., 1,800 ohms ±10%, 1/2 w	DEB-1821	.12
R19	Res., film, 10,000 ohms ±5%, 1/2 w	DCT-10-008	.25
R20	Res., comp., 180,000 ohms ±10%, 1/2 w	DEB-1841	.12
R21	Same as R19		
R24	Same as R2		
R25 thru R30	Res., ww, 3.0 ohms ±3%, 3 w	DFN-30-023	.59
T1	Transformer	ABA-238	34.00

MODELS LM-D3 — LM-D6

COMMON PARTS

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006	.27
C2	Cap., mylar, 0.22 mfd ±10%, 100 vdc	CGM-22-003	.33
C3	Cap., elect., 3,600 mfd -10%, +100%, 20 vdc	CBS-36-044	2.36
C4	Cap., elect., 3.0 mfd -10% + 75%, 100vdc	CBN-30-015	1.58
C5	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002	.36
C6	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005	.25
C7*	Cap., elect., 140 mfd -10% + 100% 30 vdc	CBR-14-030	1.58
C8	Cap., elect., 25,000 mfd -10% + 100%, 20 vdc	CBT-25-011	12.28
C9	Cap., mylar, 0.1 mfd ±10%, 200 vdc	CAM-10-012	.65
C10	Same as C9		
C11	Not used		

MODELS LM-D3 — LM-D6 (Cont)

COMMON PARTS (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C12	Cap., mylar, 0.001 mfd ±10%, 200 vdc	CGK-10-004	\$.21
CR1*	Rectifier, zener diode	FBM-Z104	4.35
CR2	Rectifier	FBL-00-030	1.40
CR3	Same as CR2		
CR4	Not used		
CR5	Not used		
CR6	Rectifier, zener diode	FBM-Z103	4.87
CR7	Same as CR2		
CR8	Rectifier	FBL-00-053	2.50
CR9	Same as CR8		
Q1	Transistor NPN	FBN-L110	3.25
Q2	Same as Q1		
Q3	Same as Q1		
Q4	Not used		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN-36486	2.75
Q7	Not used		
Q8	Transistor, NPN	FBN-36485	4.13
Q9	Same as Q8		
thru Q13			
R3	Res., ww, 1,200 ohms ±3%, 2 w	DFS-12-030	.90
R4 *	Res., film, 15,000 ohms ± 2%, 1/2 w	DCT-15-013	.30
R5	Res., film, 220 ohms ±2%, 1/2 w	DCR-22-005	.30
R6	Res., comp., 180,000 ohms ±10%, 1/2 w	DEB-1841	.12
R7	Res., film, 3,900 ohms ±5%, 1/2 w	DCS-39-014	.25
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721	.12
R9	Res., comp., 150 ohms ±10%, 1/4 w	DCB-1511	.10
R10	Res., comp., 2,200 ohms ±10%, 1/2 w	DEB-2221	.12
R11	Res., comp., 22,000 ohms ±10%, 1/2 w	DEB-2231	.12
R12	Res., comp., 47 ohms ±10%, 1/2 w	DEB-4701	.12
R13*	Res., ww, 600 ohms ±3%, 3 w	DFR-60-005	.89
R14	Not used		
R15	Not used		
R16	Res., comp., 1,800 ohms ±10%, 1/2 w	DEB-1821	.12
R17	Res., ww, 1,200 ohms ±10%, 1-1/2 w	DNS-12-026	1.25
R19	Not used		
thru R21			
R22	Res., comp., 1,200 ohms ±10%, 1/2 w	DEB-1221	.12
R23	Res., comp., 22 ohms ±10%, 1/2 w	DEB-2201	.12
S1	Thermostat	FKA-142-015	5.00

*This component not used on units with "Y" option

UNIQUE PARTS

MODEL LM-D3

F1	Fuse, cartridge, 4 amps, 3AG, SLO-BLO	FFC-04-000	.18
R1	Res., var., ww, 300 ohms ±5%, 5 w	DNR-30-016	1.95
R2	Res., ww, 430 ohms ±3% 3 w	DFR-43-058	.50

UNIQUE PARTS (Cont)

MODEL LM-D3 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R18	Not used		\$
R24	Res., comp., 330 ohms ±10%, 1 w	DGB3311	.10
R25	Res., ww, 0.22 ohms ±5%, 5 w	DFM-22-045	1.00
R26 thru R30	Same as R25		
T1	Transformer	ABA-D3	34.00
MODEL LM-D3P3			
F1	Fuse, cartridge, 4 amps 3AG, SLO-BLO	FFC04-000	.18
R1	Res., var., ww, 600 ohms ±5%, 5 w	DNR60-017 or DNR-60-028	1.93 2.50
R2	Res., ww, 430 ohms ±3%, 3 w	DFR43-058	.50
R18	Not used		
R24	Res., comp., 680 ohms ±10%, 2 w	DHB6811	.15
R25	Res., ww, 0.22 ohms ±5%, 5 w	DFM22-045	1.00
R26 thru R30	Same as R25		
T1	Transformer	ABA-D4	34.00
MODEL LM-D3P6			
F1	Fuse, cartridge, 4 amps 3AG, SLO-BLO	FFC04-000	.18
R1	Res., var., ww, 600 ohms ±5%, 5 w	DNR-60-017 or DNR-60-028	1.93 2.50
R2	Res., ww, 430 ohms ±3%, 3 w	DFR43-058	.50
R18	Not used		
R24	Res., comp., 680 ohms ±10%, 2 w	DHB6811	.15
R25	Res., ww, 0.22 ohms ±5%, 5 w	DFM22-045	1.00
R26 thru R30	Same as R25		
T1	Transformer	ABA-D4	34.00
MODEL LM-D4			
F1	Fuse, cartridge, 4 amps, 3AG, SLO-BLO	FFC04-000	.18
R1	Res., ww, 600 ohms ±5%, 5 w	DNR-60-017 or DNR-60-028	1.93 2.50
R2	Res., ww, 600 ohms ±3%, 3 w	DFR-60-005	.89
R18	Not used		
R24	Res., comp., 680 ohms ±10%, 2 w	DHB6811	.15
R25	Res., ww, 0.22 ohms ±5%, 5w	DFM22-045	1.00
R26 thru R30	Same as R25		
T1	Transformer	ABA-D4	34.00

MODEL LM-D4P5

F1	Fuse, cartridge, 5 amps 3AG, SLO-BLO	FFC05-000	.18
R1	Res., var., ww, 600 ohms ±5%, 5w	DNR60-017 or DNR-60-028	1.93 2.50

UNIQUE PARTS (Cont)

MODEL LM-D4P5 (Cont)

<u>CIRC. DESIG.</u>	<u>DESCRIPTION</u>	<u>LAMBDA NO.</u>	<u>UNIT PRICE</u>
R2	Res., ww, 650 ohms ±3%, 3 w	DFR-65-062	\$ 1.00
R18	Res., film, 390 ohms ±5%, 1/2 w	DCR39-004	.20
R24	Res., comp., 680 ohms ±10%, 2 w	DHB6811	.15
R25	Res., ww, 0.39 ohms ±5%, 5 w	DFM39-046	1.81
R26 thru R30	Same as R25		
T1	Transformer	ABA-D5	34.00

MODEL LM-D5

F1	Fuse, cartridge, 5 amps, 3AG, SLO-BLO	FFC05-000	.18
R1	Res., var., ww, 600 ohms ±5%, 5 w	DNR60-017 or DNR60-028	1.93 2.50
R2	Res., ww, 650 ohms ±3%, 3 w	DFR-65-062	1.00
R18	Res., film, 1,300 ohms ±5%, 1/2 w	DCS13-010	.25
R24	Res., comp., 680 ohms ±10%, 2 w	DHB6811	.15
R25	Res., ww, 0.39 ohms ±5%, 5 w	DFM39-046	1.81
R26 thru R30	Same as R25		
T1	Transformer	ABA-D5	34.00

MODEL LM-D6

F1	Fuse, cartridge, 5 amps, 3AG, SLO-BLO	FFC05-000	.18
R1	Res., ww, 600 ohms ±5%, 5 w	DNR60-017 or DNR60-028	1.93 2.50
R2	Res., ww, 800 ohms ±3%, 2 w	DFR80-037	.84
R18	Res., film, 1,300 ohms ±5%, 1/2 w	DCS-13-010	.25
R24	Res., comp., 680 ohms ±10%, 2 w	DHB6811	.15
R25	Res., ww, 0.39 ohms ±5%, 5 w	DFM39-046	1.81
R26 thru R30	Same as R25		
T1	Transformer	ABA-D6	34.00

MODELS LM-D8 — LM-D60

COMMON PARTS

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006	.27
C2	Cap., mylar, 0.22 mfd ±10%, 100 vdc	CGM-22-003	.33
C4	Cap., elect., 3.0 mfd -10 + 75%, 100vdc	CBN-30-015	1.58
C5+	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002	.36
C7*	Cap., elect., 140 mfd -10% + 100%, 30vdc	CBR-14-030	1.58
C9	Cap., mylar, 0.1 mfd ±10%, 200 vdc	CAM-10-012	.65
C10	Not used		

MODELS LM-D8 — LM-D60 (Cont)

COMMON PARTS (Cont)

<u>CIRC. DESIG.</u>	<u>DESCRIPTION</u>	<u>LAMBDA NO.</u>	<u>UNIT PRICE</u>
C11	Not used		\$
C12	Cap., mylar, 0.001 mfd ±10%, 200 vdc	CGK-10-004	.21
CR1*	Rectifier, zener diode	FBM-Z104	4.35
CR2	Rectifier	FBL-00-030	1.40
CR3	Same as CR2		
CR4	Not used		
CR5	Not used		
CR6	Rectifier, zener diode	FBM-Z103	4.87
CR7	Same as CR2		
Q1	Transistor, NPN	FBN-L110	3.25
Q2	Same as Q1		
Q3	Same as Q1		
Q4	Not used		
Q7	Not used		
R3	Res., ww, 1,200 ohms ±3%, 2 w	DFS-12-030	.90
R4*	Res., film, 15,000 ohms ±2%, 1/2 w	DCT-15-013	.30
R5	Res., film, 220 ohms ±2%, 1/2 w	DCR-22-005	.30
R6	Res., comp., 180,000 ohms ±10%, 1/2 w	DEB-1841	.12
R7	Res., film, 3,900 ohms ±5%, 1/2 w	DCS-39-014	.25
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721	.12
R9	Res., comp., 150 ohms ±10%, 1/4 w	DCB-1511	.10
R10	Res., comp., 2,200 ohms ±10%, 1/2 w	DEB-2221	.12
R11	Res., comp., 22,000 ohms ±10%, 1/2 w	DEB-2231	.12
R12	Res., comp., 47 ohms ±10%, 1/2 w	DEB-4701	.12
R13*	Res., ww, 600 ohms ±3%, 3 w	DFR-60-005	.89
R14	Not used		
R15	Not used		
R16	Res., comp., 1,800 ohms ±10%, 1/2 w	DEB-1821	.12
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2 w	DNS-12-026	1.25
R19 thru R21	Not used		
R22	Res., comp., 1,200 ohms ±10%, 1/2 w	DEB-1221	.12
R23	Res., comp., 22 ohms ±10%, 1/2 w	DEB-2201	.12
S1	Thermostat	FKA-142-015	5.00

*This component not used on units with "Y" option

+This part differs on model LM-D60; see LM-D60 unique parts list

UNIQUE PARTS

MODEL LM-D8

C3	Cap., elect., 3,600 mfd -10% + 100%, 20 vdc	CBS-36-044	2.36
C6	Cap., mylar, 0.018 mfd, ±10%, 200 vdc	CGL-18-005	.25
C8	Cap., elect., 25,000 mfd, -10% + 100%, 20 vdc	CBT25-011	12.28
F1	Fuse, cartridge, 7.0 amps, 3 AG, SLO-BLO	FFC-07-000	.21
CR8	Rectifier	FBL-00-054 or FBL-00-053	1.35 2.50
CR9 - CR11	Same as CR8		

UNIQUE PARTS (Cont)

MODEL LM-D8 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
Q5	Transistor, NPN	FBN-L109	\$ 2.75
Q6	Transistor, NPN	FBN-36486	2.75
Q8	Transistor, NPN	FBN-36485	4.13
Q9 - Q13	Same as Q8,		
R1	Res., var., ww, 1,000 ohms ±5%, 5 w	DNS10-027	1.50
R2	Res., ww, 1,200 ohms ±3%, 2 w	DFS12-030	.90
R18	Res., film, 2,400 ohms ±5%, 1/2 w	DCS-24-001	.25
R24	Res., comp., 1,500 ohms ±10%, 2 w	DHB-1521	.24
R25	Res., ww, 0.22 ohms ±5%, 5 w	DFM22-045	1.00
R26 thru R30	Same as R25		
T1	Transformer	ABA-D8	34.00

MODEL LM-D10

C3	Cap., elect., 2,100 mfd -10%+100%, 35 vdc	CBS21-043	3.67
C6	Cap., mylar, 0.018 mfd, ±10%, 200 vdc	CGL18-005	.25
C8	Cap., elect., 14,000 mfd, -10%+100%, 35 vdc	CBT14-012	12.28
F1	Fuse, cartridge, 7.0 amps, 3 AG, SLO-BLO	FFC07-000	.21
CR8	Rectifier	FBL-00-054 or FBL-00-053	1.35 2.50
CR9- CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN 36486	2.75
Q8	Transistor, NPN	FBN 36485	4.13
Q9- Q13	Same as Q8		
R1	Res., var., ww, 2,200 ohms ±5%, 5 w	DNS22-029 or DNS22-056	1.75 2.50
R2	Res., ww, 1,200 ohms ±3%, 2 w	DFS12-030	.90
R18	Res., film, 2,400 ohms ±5%, 1/2 w	DCS24-001	.25
R24	Res., comp., 1,500 ohms ±10%, 2 w	DHB1521	.24
R25	Res., ww, 0.68 ohms ±5%, 5 w	DFM68-048	.85
R26 thru R30	Same as R25		
T1	Transformer	ABA-D10	34.00

MODEL LM-D12

C3	Cap., elect., 2,100 mfd, -10%+100%, 35 vdc	CBS-21-043	3.67
C6	Cap., mylar, 0.018 mfd, ±10%, 200 vdc	CGL-18-005	.25
C8	Cap., elect., 14,000 mfd -10%+100%, 35 vdc	CBT-14-012	12.28
F1	Fuse, cartridge, 7.0 amps, 3 AG, SLO-BLO	FFC07-000	.21
CR8	Rectifier	FBL-00-054 or FBL-00-053	1.35 2.50
CR9- CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN36486	2.75

UNIQUE PARTS (Cont)

MODEL LM-D12 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
Q8	Transistor, NPN	FBN-36485	\$ 4.13
Q9- Q13	Same as Q8,		
R1	Res., var., ww, 2,200 ohms ±5%, 5 w	DNS-22-029 or DNS-22-056	1.75 2.50
R2	Res., ww, 1,800 ohms ±3% 3 w	DFS18-048	.60
R18	Res., film, 2,400 ohms ±5%, 1/2 w	DCS24-001	.25
R24	Res., comp., 1,500 ohms ±10%, 2 w	DHB-1521	.24
R25	Res., ww, 0.68 ohms ±5%, 5 w	DFM68-048	.85
R26 thru R30	Same as R25		
T1	Transformer	ABA-D12	34.00

MODEL LM-D15

C3	Cap., elect., 2,100 mfd, -10%+100%, 35 vdc	CBS21-043	3.67
C6	Cap., mylar, 0.018 mfd, ±10%, 200 vdc	CGL18-005	.25
C8	Cap., elect., 14,000 mfd, -10%+100%, 35 vdc	CBT14-012	12.28
F1	Fuse, cartridge, 7.0 amps 3 AG, SLO-BLO	FFC07-000	.21
CR8	Rectifier	FBL-00-054 or FBL-00-041	1.35 1.23
CR9- CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN 35469	4.29
Q8	Transistor, NPN	FBN36220	6.60
Q9- Q13	Same as Q8,		
R1	Res., var., ww, 2,200 ohms ±5%, 5 w	DNS22-029 or DNS22-056	1.75 2.50
R2	Res., ww, 1,800 ohms ±3%, 3 w	DFS-18-048	.60
R18	Res., film, 2,400 ohms ±5%, 1/2 w	DCS24-001	.25
R24	Res., comp., 2,200 ohms ±10%, 2 w	DHB-2221	.25
R25	Res., ww, 0.68 ohms ±5%, 5 w	DFM-68-048	.85
R26 thru R30	Same as R25		
T1	Transformer	ABA-D15	34.00

MODEL LM-D18

C3	Cap., elect., 2,100 mfd, -10%+100% 35 vdc	CBS21-043	3.67
C6	Cap., mylar, 0.018 mfd, ±10%, 200 vdc	CGL-18-005	.25
C8	Cap., elect., 14,000 mfd, -10%+100%, 35 vdc	CBT14-012	12.28
F1	Fuse, cartridge, 7.0 amps, 3 AG, SLO-BLO	FFC 07-000	.21
CR8	Rectifier	FBL-00-054 or FBL-00-041	1.35 1.23
CR9- CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN35469	4.29
Q8	Transistor, NPN,	FBN36220	6.60
Q9- Q13	Same as Q8,		

UNIQUE PARTS (Cont)

MODEL LM-D18 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R1	Res., var., ww, 2,200 ohms $\pm 5\%$, 5 w	DNS22-029 or DNS-22-056	\$ 1.75 2.50
R2	Res., ww, 2,500 ohms $\pm 3\%$, 3 w	DFS25-036	.53
R18	Res., film, 6,800 ohms $\pm 5\%$, 1/2 w	DCS68-021	.25
R24	Res., comp., 2,200 ohms $\pm 10\%$, 2 w	DHB2221	.25
R25	Res., ww, 1.0 ohms $\pm 3\%$, 5 w	DFN10-014	.67
R26 thru R30	Same as R25		
T1	Transformer	ABA-D18	34.00

MODEL LM-D20

C3	Cap., elect., 1,100 mfd, -10%+100% 60 vdc	CBS11-042	3.67
C6	Cap., mylar, 0.018 mfd, $\pm 10\%$, 200 vdc	CGL18-005	.25
C8	Cap., elect., 7,800 mfd, -10%+100% 60 vdc	CBS78-045	8.18
F1	Fuse, cartridge, 7.0 amps, 3 AG, SLO-BLO	FFC07-000	.21
CR8	Rectifier	FBL-00-054 or FBL-00-041	1.35 1.23
CR9-CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN36488	3.75
Q8	Transistor, NPN.	FBN 36487	5.63
Q9-Q13	Same as Q8,		
R1	Res., var., ww, 2,200 ohms $\pm 5\%$, 5 w	DNS22-029 or DNS22-056	1.75 2.50
R2	Res., ww, 2,500 ohms $\pm 3\%$, 3 w	DFS25-036	.53
R18	Res., film, 6,800 ohms $\pm 5\%$, 1/2 w	DCS68-021	.25
R24	Res., comp., 3,300 ohms $\pm 10\%$, 2 w	DHB3321	.13
R25	Res., ww, 1.0 ohms $\pm 3\%$, 5 w	DFN10-014	.67
R26 thru R30	Same as R25		
T1	Transformer	ABA-D20	34.00

MODEL LM-D24

C3	Cap., elect., 1,100 mfd, -10%+100% 60 vdc	CBS11-042	3.67
C6	Cap., mylar, 0.018 mfd, $\pm 10\%$, 200 vdc	CGL18-005	.25
C8	Cap., elect., 7,800 mfd, -10%+100% 60 vdc	CBS 78-045	8.18
F1	Fuse, cartridge, 7.0 amps, 3 AG, SLO-BLO	FFC 07-000	.21
CR8	Rectifier	FBL-00-054 or FBL-00-041	1.35 1.23
CR9-CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN 36488	3.75
Q8	Transistor, NPN,	FBN 36487	5.63
Q9-Q13	Same as Q8,		
R1	Res., var., ww, 2,200 ohms $\pm 5\%$, 5 w	DNS22-029 or DNS22-056	1.75 2.50

UNIQUE PARTS (Cont)

MODEL LM-D24 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R2	Res., ww, 3,600 ohms $\pm 3\%$, 3 w	DFS 36-050	\$.60
R18	Res., film, 6,800 ohms $\pm 5\%$, 1/2 w	DCS68-021	.25
R24	Res., comp., 3,300 ohms $\pm 10\%$, 2 w	DHB3321	.13
R25	Res., ww, 1.25 ohms $\pm 3\%$, 3 w	DFN13-051	.66
R26 thru R30	Same as R25		
T1	Transformer	ABA-D24	34.00

MODEL LM-D28

C3	Cap., elect., 1,100 mfd, -10%+100% 60 vdc	CBS11-042	3.67
C6	Cap., mylar, 0.018 mfd, $\pm 10\%$, 200 vdc	CGL18-005	.25
C8	Cap., elect., 7,800 mfd, -10%+100% 60 vdc	CBS78-045	8.18
F1	Fuse, cartridge, 7.0 amps, 3 AG, SLO-BLO	FFC07-000	.21
CR8	Rectifier	FBL-00-054 or FBL-00-041	1.35 1.23
CR9-CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN36488	3.75
Q8	Transistor, NPN,	FBN36487	5.63
Q9-Q13	Same as Q8,		
R1	Res., var., ww, 2,200 ohms $\pm 5\%$, 5 w	DNS22-029 or DNS22-056	1.75 2.50
R2	Res., ww, 4,500 ohms $\pm 3\%$, 3 w	DFS45-044	.87
R18	Res., film, 6,800 ohms $\pm 5\%$, 1/2 w	DCS68-021	.25
R24	Res., comp., 3,300 ohms $\pm 10\%$, 2 w	DHB3321	.13
R25	Res., ww, 1.25 ohms $\pm 3\%$, 3 w	DFN13-051	.66
R26 thru R30	Same as R25		
T1	Transformer	ABA-D28	34.00

MODEL LM-D36

C3	Cap., elect., 1,100 mfd, -10%+100% 60 vdc	CBS11-042	3.67
C6	Cap., mylar, 0.018 mfd, $\pm 10\%$, 200 vdc	CGL18-005	.25
C8	Cap., elect., 7,800 mfd, -10%+100% 60 vdc	CBS78-045	8.18
F1	Fuse, cartridge, 8.0 amps, 3 AG, SLO-BLO	FFC-08-000	.21
CR8	Rectifier	FBL00-054	1.35
CR9-CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L108	2.52
Q6	Transistor, NPN	FBN36488	3.75
Q8	Transistor, NPN,	FBN 36487	5.63
Q9-Q13	Same as Q8,		
R1	Res., var., ww, 3,300 ohms $\pm 5\%$, 5 w	DNS33-033 or DNS33-057	1.50 2.50
R2	Res., ww, 5,600 ohms $\pm 3\%$, 3 w	DFS56-053	.60
R18	Res., film, 10,00 ohms $\pm 5\%$, 1/2 w	DCT10-008	.25

UNIQUE PARTS (Cont)

MODEL LM-D36 (Cont)

<u>CIRC. DESIG.</u>	<u>DESCRIPTION</u>	<u>LAMBDA NO.</u>	<u>UNIT PRICE</u>
R24	Res., comp., 3,300 ohms ±10%, 2 w	DHB-3321	\$.13
R25	Res., ww, 1.25 ohms ±3%, 3 w	DFN-13-051	.66
R26 thru R30	Same as R25		
T1	Transformer	ABA-D36	34.00

MODEL LM-D48

C3	Cap., elect., 400 mfd, -10%+100% 100 vdc	CBR-40-044	2.68
C6	Cap., mylar, 0.01 mfd, ±10%, 200 vdc	CGL-10-002	.36
C8	Cap., elect., 3,000 mfd, -10%+100% 100 vdc	CBS-30-047	11.16
F1	Fuse, cartridge, 8.0 amps, 3 AG, SLO-BLO	FFC-08-000	.21
CR8	Rectifier	FBL-00-054	1.35
CR9- CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L108	2.52
Q6	Transistor, NPN	FBN-35903	5.17
Q8	Transistor, NPN	FBN-36487	5.63
Q9- Q13	Same as Q8		
R1	Res., var., ww, 3,300 ohms ±5%, 5 w	DNS-33-033 or DNS33-057	1.50 2.50
R2	Res., ww, 8,000 ohms ±3%, 3 w	DFS-80-054	1.03
R18	Res., film, 10,000 ohms ±5%, 1/2 w	DCT-10-008	.25
R24	Res., comp., 4,700 ohms ±10%, 2 w	DHB-4721	.15
R25	Res., ww, 1.5 ohms ±3%, 3 w	DFN-15-042	.60
R26 thru R30	Same as R25		
T1	Transformer	ABA-D48	34.00

MODEL LM-D60

C3	Cap., elect., 400 mfd -10 +100%, 100 vdc	CBR-40-044	2.68
C5	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005	.25
C6	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002	.36
C8	Cap., elect., 3,000 mfd -10 +100%, 100 vdc	CBS-30-047	11.16
F1	Fuse, cartridge, 8.0 amps, 3 AG, "SLO-BLO"	FFC-08-000	.21
CR8	Rectifier	FBL-00-054	1.35
CR9 thru CR11	Same as CR8		
Q5	Transistor, NPN	FBN-L108	2.25
Q6	Transistor, NPN	FBN-35903	5.17
Q8	Transistor, NPN,	FBN-35902	9.90
Q9 thru Q13	Same as Q8,		
R1	Res., var., ww, 4,500 ohms ±5%, 5 w	DNS-45-030 or DNS-45-050	2.38 2.50
R2	Res., ww, 10,000 ohms ±3%, 5 w	DFT-10-042	.65
R18	Res., film, 15,000 ohms ±5%, 1/2 w	DCT-15-013	.30

UNIQUE PARTS (Cont)

MODEL LM-D60 (Cont)

<u>CIRC. DESIG.</u>	<u>DESCRIPTION</u>	<u>LAMBDA NO.</u>	<u>UNIT PRICE</u>
R24	Res., comp., 5,600 ohms ±10%, 2 w	DHB-5621	\$.50
R25	Res., ww, 1.5 ohms ±3%, 3 w	DFN-15-042	.60
R26 thru R30	Same as R25		
T1	Transformer	ABA-D60	34.00

COMMON PARTS

MODELS LM-D100 — LM-D150

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006	.27
C2	Cap., mylar, 0.15 mfd ±10%, 200 vdc	CGM-15-005	.40
C3	Cap., elect., 200 mfd -10% + 100%, 250 vdc	CBR-20-045	2.68
C4	Cap., elect., 3.5 mfd -10 + 100%, 300 vdc	CBN-35-018	1.12
C5, C6	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002	.36
C6A	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002	.36
C7*	Cap., elect., 140 mfd -10 + 100%, 30 vdc	CBR-14-030	1.58
C8	Cap., elect., 1,200 mfd -10 +100%, 250 vdc	CBS-12-048	11.16
C9, C10	Not assigned		
C11	Cap., mylar, 0.033 mfd +10%, 400 vdc	CGL-33-006	.27
C12	Cap., mylar, .001 mfd ±10%, 200 vdc	CGK-10-004	.21
C13, C14	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005	.25
CR1*	Rectifier, zener diode	FBM-Z104	4.35
CR2	Rectifier	FBL-00-030	1.40
CR3	Same as CR2		
CR4, CR5	Not assigned		
CR6	Rectifier, zener diode	FBM-Z103	4.87
CR7	Same as CR2		
F1	Fuse, "SLO-BLO", 8.0 amperes 3 AG	FFC-08-000	.21
Q1	Transistor, NPN	FBN-L110	3.25
Q2	Same as Q1		
Q3	Same as Q1		
Q4	Not assigned		
Q5	Transistor, NPN	FBN-L108	2.25
Q6	Transistor, NPN	FBN-35903	5.17
Q7	Not assigned		
Q8	Same as Q5		
Q9	Same as Q6		
Q10	Transistor, NPN	FBN-35902	9.90
Q11 thru Q13	Same as Q10,		
R1	Res., var., ww, 9,000 ohms ±5%, 5 w	DNS-90-031 or DNS-90-058	2.38 2.50
R3	Res., ww, 1,200 ohms ±3%, 2w	DFS-12-030	.90
R4*	Res., film, 15,000 ohms ±2%, 1/2 w	DCT-15-013	.30
R5	Res., film, 220 ohms ±2%, 1/2 w	DCR-22-005	.30
R6	Res., comp., 180,000 ohms ±10%, 1/2 w	DEB-1841	.12
R7	Res., film, 3,900 ohms ±5%, 1/2	DCS-39-014	.25
R7A	Res., comp., 3,900 ohms ±10%, 1/4 w	DCB-3921	.10
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721	.12

COMMON PARTS (Cont)

MODELS LM-D100 — LM-D150 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R9	Res., comp., 150 ohms ±10%, 1/4 w	DCB-1511	\$.10
R10	Res., comp., 3,900 ohms ±10%, 1/2 w	DEB-3921	.12
R11	Res., comp., 22,000 ohms ±10%, 1/2 w	DEB-2231	.12
R12	Res., comp., 47 ohms ±10% 1/2 w	DEB-4701	.12
R13*	Res., ww, 600 ohms ±3%, 3 w	DFR-60-005	.89
R14, R15	Not assigned		
R16	Res., comp., 1,200 ohms ±10%, 1/4 w	DEB-1221	.12
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2 w	DNS-12-026	1.25
R19 thru R21	Not assigned		
R22	Res., comp., 150 ohms ±10%, 1/2 w	DEB-1511	.12
R23	Res., comp., 33 ohms ±10%, 1/2 w	DEB-3301	.12
R25, R26	Res., ww, 1.5 ohms ±3%, 3w	DFN-15-042	.60
R27	Not assigned		
R28	Res., comp., 68 ohms ±10%, 1/2 w	DEB-6801	.12
R29	Same as R28		
R30 thru R35	Not assigned		
R38 thru R46	Not assigned		
R47	Same as R22		
S1	Thermostat	FKA-142-015	5.00
XF1	Fuseholder	HRM-00-009	.20

*This component not used on units with "Y" option

UNIQUE PARTS

MODEL LM-D150

CR8 CR9 thru CR11	Rectifier	FBL-00-066	1.45
R2	Res. ww, 26,000 ohms ±3%, 5 w	DFT-26-041	1.20
R18	Res. film, 56,000 ohms ±5%, 1 w	DCT-56-017	.25
R24	Res. comp., 47,000 ohms ±10%, 2 w	DHB-4731	.24
R36	Res., film, 33,000 ohms ±2%, 2 w	DCT-33-019	1.00
R37	Same as R36		
T1	Transformer	ABA-D150	34.00

MODEL LM-D100

CR8 CR9 thru CR11	Rectifier	FBL-00-065	1.15
R2	Res., ww, 16,000 ohms ±3%, 5 w	DFT-16-039	.85
R18	Res., film, 39,000 ohms ±5%, 1/2 w	DCT-39-015	.30

UNIQUE PARTS (Cont)

MODEL LM-D100 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R24	Res., comp., 27,000 ohms ±10%, 2 w	DHB-2731	\$.15
R36	Res., film, 24,000 ohms ±2%, 2 w	DCT-24-018	.50
R37 T1	Same as R36 Transformer	ABA-D100	34.00

MODEL LM-D120

CR8	Rectifier	FBL-00-065	1.15
CR9 thru CR11	Same as CR8		
R2	Res., ww, 20,000 ohms ±3%, 5 w	DFT-20-040	.85
R18	Res., film, 43,000 ohms ±5%, 1/2 w	DCT-43-016	.30
R24	Res., comp., 27,000 ohms ±10%, 2 w	DHB-2731	.15
R36	Res., film, 24,000 ohms ±2%, 2 w	DCT-24-018	.50
R37 T1	Same as R36 Transformer	ABA-D120	34.00

MODELS LMD-0-14 — LMD-0-60

COMMON PARTS

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006	.27
C2	Cap., mylar, 0.22 mfd ±10%, 100 vdc	CGM-22-003	.33
C4	Cap., elect., 3.0 mfd -10 + 75%, 100 vdc	CBN-30-015	1.58
C5	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002	.36
C6	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005	.25
C7*	Cap., elect., 140 mfd -10 + 100%, 30 vdc	CBR-14-030	1.58
C9	Cap., mylar, 0.1 mfd ±10%, 200 vdc	CAM-10-012	.65
CR1*	Rectifier, zener diode	FBM-Z104	4.35
CR2 CR3 thru CR5	Rectifier Not assigned	FBL-00-030	1.40
CR6 CR7	Rectifier Same as CR2	FBM-Z103	4.87
CR13, CR14 CR16, CR17 CR18, CR19	Not assigned Same as CR2		
F1	Fuse, "Slo-Blo", 4 amperes, 3AG	FFC-04-000	.18
Q1	Transistor, NPN	FBN-L110	3.25
Q2	Same as Q1		
Q3	Same as Q1		
Q4	Not assigned		
Q7	Not assigned		
Q14 thru Q27	Not assigned		
R2	Not assigned		
R3	Res., ww, 1,100 ohms ±3%, 2 w	DFS-11-061	.60

COMMON PARTS (Cont)

MODELS LMD-0-14 — LMD-0-60 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R4*	Res., film, 15,000 ohms ±2%, 1/2 w	DCT-15-013	\$.30
R5	Res., film, 220 ohms ±2%, 1/2 w	DCR-22-005	.30
R6	Res., comp., 180,000 ohms ±10%, 1/2 w	DEB-1841	.12
R7	Res., film, 3,900 ohms ±5%, 1/2 w	DCS-39-014	.25
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721	.12
R9	Res., comp., 150 ohms ±10%, 1/4 w	DCB-1511	.10
R10	Res., comp., 2,200 ohms ±10%, 1/2 w	DEB-2221	.12
R11, R12	Not assigned		
R13*	Res., ww, 600 ohms ±3%, 3 w	DFR-60-005	.89
R14, R15	Not assigned		
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2 w	DNS-12-026	1.25
R18 thru R21	Not assigned		
R22	Res., comp., 1,200 ohms ±10%, 1/2 w	DEB-1221	.12
R23	Res., comp., 22 ohms ±10%, 1/2 w	DEB-2201	.12
R24	Not assigned		
R31 thru R42	Not assigned		
R43	Res., comp., 1,000 ohms ±10%, 1/2 w	DEB-1021	.12
R46	Res., comp., 47 ohms ±5%, 1/2 w	DEB-4705	.24
S1	Thermostat	FKA-142-015	5.00
XF1	Fuseholder	HRM-00-009	.20

*This component not used on units with "Y" option

UNIQUE PARTS

MODEL LMD-0-14

C3	Cap., elect., 2,100 mfd -10 + 100%, 35 vdc	CBS-21-043	3.67
C8	Cap., elect., 9,000 mfd -10 + 100%, 45 vdc	CBS-90-021	12.28
C12	Cap., mylar, .001 mfd ±10%, 200 vdc	CGK-10-004	.21
CR8	Rectifier	FBL-00-054 or FBL-00-041	1.35 1.23
CR9 CR11 CR12 CR15	Same as CR8 Rectifier Not assigned	FBL-00-055	2.00
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN-36486	2.75
Q8	Transistor, NPN	FBN-36485	4.13
Q9 thru Q13 Q28	Same as Q8		
R1	Res., var., ww, 3,300 ohms ±5%, 5 w	DNS-33-033 or DNS-33-057	1.50 2.50

UNIQUE PARTS (Cont)

MODEL LMD-0-14 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R16	Res., comp., 470 ohms ±10%, 1/2 w	DEB-4711	\$.12
R25	Res., ww, 1.25 ohms ±3%, 3 w	DFN-13-051	.66
R26 thru R30	Same as R25		
R44	Res., comp., 2,200 ohms ±10%, 1/2 w	DEB-2221	.12
R45	Res., film, 820 ohms ±5%, 1 w	DCR-82-018	.60
T1	Transformer	ABA-D-014	23.50

MODEL LMD-0-32

C3	Cap., elect., 1,100 mfd -10 + 100%, 60 vdc	CBS-11-042	3.67
C8	Cap., elect., 3,600 mfd -10 + 100%, 75 vdc	CBS-36-020	10.79
C12 CR8	Not assigned Rectifier	FBL-00-054 or FBL-00-049	1.35 1.15
CR9 CR11 CR12 CR15	Same as CR8 Rectifier Not assigned	FBL-00-055	2.00
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN-36488	3.75
Q8	Transistor, NPN	FBN-36487	5.63
Q9 thru Q13 Q28	Same as Q8		
R1	Res., var., ww, 9,000 ohms ±5%, 5 w	DNS-90-031 or DNS-90-058	2.38 2.50
R16	Res., comp., 1,800 ohms ±10%, 1/2 w	DEB-1821	.12
R25	Res., ww, 3.0 ohms ±3%, 3 w	DFN-30-023	.59
R26 thru R30	Same as R25		
R44	Res., comp., 4,700 ohms ±10%, 2 w	DHB-4721	.15
R45	Res., ww, 2,000 ohms ±3%, 3 w	DFS-20-032	.87
T1	Transformer	ABA-D-032	23.50

MODEL LMD-0-60

C3	Cap., elect., 400 mfd -10 + 100%, 100 vdc	CBR-40-044	2.68
C8	Cap., elect., 3,100 mfd -10 + 100%, 110 vdc	CBS-31-024	11.97
C12 CR8	Not assigned Rectifier	FBL-00-054 or FBL-00-049	1.35 1.15
CR9 CR11 CR12 CR15	Same as CR8 Rectifier Not assigned	FBL-00-065	1.15
Q5	Transistor, NPN	FBN-L108	2.25
Q6	Transistor, NPN	FBN-35903	5.17
Q8	Transistor, NPN	FBN-35902	9.90

UNIQUE PARTS (Cont)

MODEL LMD-0-60 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
Q9 thru Q13	Same as Q8		\$
Q28 R1	Same as Q5		
R1	Res., var., ww, 13,000 ohms $\pm 5\%$, 5 w	DNT-13-018 or DNT-13-037	6.00 5.75
R16	Res., comp., 1,800 ohms $\pm 10\%$, 1/2 w	DEB-1821	.12
R25	Res., ww, 6.0 ohms $\pm 3\%$, 3 w	DFN-60-054	.83
R26 thru R30	Same as R25		
R44	Res., ww, 4,500 ohms $\pm 3\%$, 3 w	DFS-45-044	.87
R45 T1	Same as R44 Transformer	ABA-D-060	23.50

PARTS FOR MODEL LM-234

C1	Cap, mylar, 0.033 mfd $\pm 10\%$, 400 vdc	CGL-33-006	.27
C2	Cap, mylar, 0.22 mfd $\pm 10\%$, 100 vdc	CGM-22-003	.33
C3	Cap, elect., 3,200 mfd -10% + 100%, 28 vdc	CBS-32-027	2.31
C4	Cap., elect., 3.0 mfd -10% + 75%, 100 vdc	CBN-30-015	1.58
C5	Cap., mylar, 0.01 mfd $\pm 10\%$, 200 vdc	CGL-10-002	.36
C6	Cap., mylar, 0.0033 mfd $\pm 10\%$, 200 vdc	CGK-33-003	.33
C7*	Cap., elect., 140 mfd -10% + 100%, 30 vdc	CBR-14-030	1.58
C8	Cap., elect., 15,700 mfd -10% + 100%, 28 vdc	CBT-16-010	10.28
C9	Cap., mylar, 0.1 mfd $\pm 10\%$, 200 vdc	CAM-10-012	.65
C10	Same as C9		
C11	Not assigned		
C12+	Cap., mylar, 0.001 mfd $\pm 5\%$, 200 vdc	CGK-10-004	.21
CR1*	Rectifier, zener diode	FBM-Z104	4.35
CR2	Rectifier	FBL-00-030	1.40
CR3	Not assigned		
CR4	Not assigned		
CR5	Not assigned		
CR6	Rectifier, zener diode	FBM-Z103	4.87
CR7	Same as CR2		
CR8	Rectifier	or FBL-00-054 FBL-00-046	1.35 1.25
CR9	Not assigned		
CR10	Same as CR8		
CR11	Not assigned		
CR12	Same as CR8		
F1	Fuse, 4 amperes, SLO-BLO, 3 AG	FFC-04-000	.18
Q1	Transistor, NPN	FBN-L110	3.25
Q2	Same as Q1		
Q3	Same as Q1		
Q4	Not assigned		
Q5	Transistor, NPN	FBN-L109	2.75
Q6	Transistor, NPN	FBN-36486	2.75
Q7	Not assigned		
Q8 thru Q13	Transistor, NPN	FBN-36485	4.13
R1	Res., var., ww, 2,200 ohms $\pm 5\%$, 5 w	DNS-22-029 or DNS-22-056	1.75 2.50
R2	Not assigned		

PARTS FOR MODEL LM-234 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R3	Res., ww, 1,100 ohms $\pm 3\%$, 2w	DFS-11-061	\$.60
R4*	Res., film, 15,000 ohms, $\pm 2\%$, 1/2 w	DCT-15-013	.30
R5	Res., film, 220 ohms $\pm 2\%$, 1/2 w	DCR-22-005	.30
R6	Res., comp., 180,000 ohms $\pm 10\%$, 1/2 w	DEB-1841	.12
R7	Res., film, 3,900 ohms $\pm 5\%$, 1/2 w	DCS-39-014	.25
R8	Res., comp., 4,700 ohms $\pm 10\%$, 1/4w	DCB-4721	.12
R9	Res., comp., 150 ohms $\pm 10\%$, 1/4 w	DCB-1511	.10
R10	Res., comp., 3,900 ohms $\pm 10\%$, 1/2 w	DEB-3921	.12
R11	Not assigned		
R12	Not assigned		
R13*	Res., ww, 600 ohms $\pm 3\%$, 3 w	DFR-60-005	.89
R14	Not assigned		
R15	Not assigned		
R16	Res., comp., 1,800 ohms $\pm 10\%$, 1/2 w	DEB-1821	.12
R17	Res., var., ww, 1,200 ohms $\pm 10\%$, 1-1/2 w	DNS-12-026	1.25
R18	Not assigned		
R19++	Res., comp., 1,800 ohms $\pm 10\%$, 1 w	DGB-1821	.08
R20	Res., ww, 100 ohms $\pm 3\%$, 10 w	DFR-10-056	1.05
R21	Not assigned		
R22	Res., comp., 1,200 ohms $\pm 10\%$, 1/2 w	DEB-1221	.12
R23	Res., comp., 100 ohms $\pm 10\%$, 1/2 w	DEB-1011	.12
R24	Not assigned		
R25 thru R30	Res., ww, 1.0 ohm $\pm 3\%$, 3 w	DFN-10-041	.66
S1	Thermostat	FKA-142-015	5.00
T1	Transformer	ABA-234	34.00

*This part not used on units with "Y" option

+This part not used on units with serial no. prefixes A and B.

++This part only used on units with serial no. prefixes

A-C

PARTS FOR "MP" OPTION

MODELS MP-5, P-5

DS1	Pilot light assembly (ALL)	HRD 00-007	.83
F1	Fuse, 3AG, "SLO-BLO", 8 amperes (LM-D36 thru LM-D150)	FFC-08-000	.21
F1	Fuse, 3AG, "SLO-BLO", 4 amperes (LM-234, LM-D3 thru LM-D4)	FFC 04-000	.18
F1	Fuse, 3AG, "SLO-BLO", 5 amperes (LM-D4P5, D5, D6)	FFC 05-000	.18
F1	Fuse, 3AG, "SLO-BLO", 7 amperes (LM235, thru LM238, LM-D8 thru LM-D28)	FFC 07-000	.21
F1	Fuse, 3AG, "SLO-BLO", 3 amperes (LM-DO-14 thru DO-60)	FFC-03-000	.18
XF1	Fuseholder (ALL)	HRK 00-005	.50

PARTS FOR "MP" OPTION (Cont)

MODELS MP-5, P-5 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
M1*	Meter, volts, D.C., 0-5 vdc (LM-D3 thru LM-D4P5)	EBN 50-003	\$14.40
M1*	Meter, volts, D.C., 0-8 vdc (LM-D5, LM-D6)	EBN 80-005	12.00
M1*	Meter, volts, D.C., 0-10 vdc (LM234, LM-D8)	EBP 10-016	18.00
M1*	Meter, volts, D.C., 0-15 vdc (LM235, LMD-0-14 LM-D12)	EBP 15-017	18.00
M1*	Meter, volts, D.C., 0-20 vdc (LM-D15, LM-D18)	EBP 20-014	18.00
M1*	Meter, volts, D.C., 0-25 vdc (LM236, LM-D20)	EBP 25-018	18.00
M1*	Meter, volts, D.C., 0-40 vdc (LM237, LM-D24, D28, D36, LMD-0-32)	EBP 40-013	18.00
M1*	Meter, volts, D.C., 0-60 vdc (LM238, LMD48, LMD-0-60)	EBP 60-015	18.00
M1*	Meter, volts, D.C., 0-8 vdc (LM-D60)	EBP-80-019	18.00
M1*	Meter, volts, D.C. 0-120 vdc (LM-D100)	EBR-12-075	18.00
M1*	Meter, volts, D.C., 0-150 vdc (LM-D120)	EBR-15-076	18.00
M1*	Meter, volts, D.C., 0-200 vdc (LM-D150)	EBR-20-077	18.00
M2*	Meter, amperes, D.C., 0-3 amperes (LM238, LM-D60, LMD-0-32)	EDN 30-019	18.00
M2*	Meter, amperes, D.C., 0-5 amperes (LM237, LM-D48, LMD-0-14)	EDN 50-021	18.00
M2*	Meter, amperes, D.C., 0-10 amperes (LM234, LM235, LM236, LM-D12 thru LM-D24)	EDP 10-013	18.00
M2*	Meter, amperes, D.C., 0-15 amperes (LM-D3 thru LM-D10)	EDP 15-014	18.00
M2*	Meter, amperes, D.C., 0-6 amperes (LM-D28, D36)	EDN-60-018	18.00
M2*	Meter, amperes, D.C., 0-2 amperes (LM-D100)	EDN-20-022	18.00
M2*	Meter, amperes, D.C., 0-1.5 amperes (LM-D120, D150, LMD-0-60)	EDN-15-020	18.00
R1	Res., var., ww, 2,200 ohms $\pm 5\%$, 5w (LM234, LM235, LM-D10 thru LM-D28)	DNS 22-023 or DNS-22-053	1.75 2.50
R1	Res., var., ww, 4,500 ohms $\pm 5\%$, 5w (LM236, LM237, LM-D60)	DNS 45-024 or DNS-45-059	1.75 2.50
R1	Res., var., ww, 9,000 ohms $\pm 5\%$, 5w (LM238, LM-D100 thru 150, LMD-0-32)	DNS 90-025 or DNS 90-051	2.00 2.50
R1	Res., var., ww, 300 ohms $\pm 5\%$, 5w (LM-D3)	DNR 30-018	1.95
R1	Res., var., ww, 600 ohms, $\pm 5\%$, 5w (LM-D3P3 thru LM-D6)	DNR 60-019 or DNR-60-026	2.25 2.50
R1	Res., var., ww, 1,000 ohms $\pm 5\%$, 5w (LM-D8)	DNS 10-032	1.95
R1	Res., var., ww, 3,300 ohms $\pm 5\%$, 5w (LM-D36, D48, D-0-14)	DNS 33-035 or DNS-33-054	2.00 2.50

PARTS FOR "MP" OPTION (Cont)

MODELS MP-5, P-5 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R1	Res., var., ww, 13,000 ohms $\pm 5\%$, 5w LMD-0-60	DNT-13-008 or DNT-13-031	\$2.48 2.50
S1	Switch, SPST (ALL)	FDA11-017	2.50
C1	Cap., Tant. 2.5 mfd -15 + 75%, 100 vdc (ALL)	CBN-25-010	1.80
C2	Same as C1		

* This part only used on MP-5

PARTS FOR "OV" OPTION

COMMON PARTS

MODELS LMOV -1, -2, -3

C1	Cap., mylar, 0.01 mfd $\pm 20\%$, 80 vdc	CGL-10-008	.25
Q1	Transistor, NPN	FBN-L102	2.40
R3	Res., film, 200 ohms $\pm 5\%$, 1/2w	DCR-20-010	.20
R4	Res., thermistor, 425 ohms $\pm 5\%$, 1-1/4 w	DKR-43-001	1.52
R5	Res., comp., 1,200 ohms $\pm 10\%$, 1/2w	DEB-1221	.12
R6	Same as R5		
R8	Res., comp., 15,000 ohms $\pm 10\%$, 1/2w	DEB-1531	.12
R10	Same as R5		
SCR1	Rectifier, silicon, controlled	FBP-00-009	5.50

UNIQUE PARTS

MODEL LMOV-1

Q2	Transistor, PNP	FBN-L103	1.76
R1	Res., var., ww, 2,000 ohms $\pm 10\%$, 1w	DNS-20-034	3.00
R2	Res., film, 560 ohms $\pm 2\%$, 1/2w	DCR-56-002	.65
R7	Res., comp., 33 ohms $\pm 5\%$, 1/4w	DCB-3305	.15
R9	Not assigned		

MODEL LMOV-2

Q2	Transistor, PNP	FBN-L103	1.76
R1	Res., var., ww, 5,000 ohms $\pm 10\%$, 1w	DNS-50-036	3.15
R2	Res., film, 1,470 ohms $\pm 1\%$, 1/2w	DC5-15-031	.30
R7	Res., comp., 33 ohms $\pm 5\%$, 1/4w	DCB-3305	.15
R9	Not assigned		

MODEL LMOV-3

Q2	Transistor, PNP	FBN-L114	3.50
R1	Res., var., ww, 20,000 ohms $\pm 10\%$, 1w	DNT-20-010	3.25
R2	Res., film, 4,700 ohms $\pm 2\%$, 1/2w	DCS-47-028	.30
R7	Res., comp., 39 ohms $\pm 5\%$, 1/4w	DCB-3905	.15
R9	Res., comp., 22 ohms $\pm 10\%$, 1/2w	DEB-2201	.12

PARTS FOR "Y" OPTION

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C107	Cap., elec., 40 mfd 35 vdc	CBP-40-014	\$ 1.68
CR1	Rectifier, zener diode	FBM-Z107	3.75
CR101	Rectifier, zener diode	FBM-Z104	4.35
Q101	Transistor NPN	FBN-L109	2.75
R4	Res., comp., 220,000 ohms $\pm 10\%$ 1/2w	DEB-2241	.12
R101	Res., film, 6,800 ohms $\pm 2\%$, 1/4w	DCS-68-032	.30
R102	Res., film 220 ohms $\pm 2\%$, 1/4w	DCR-22-014	.30

PARTS FOR "T" OPTION

For all "D" package models except F1 changes on LMD-0-14, 0-32, 0-60: LM234 thru LM238; LM-D3 thru LM-D4

The following parts change and a resistor is added in series to DS-1 of "MP" option:

C1	Cap., mylar, 0.033 mfd $\pm 10\%$, 600 vdc	CGL-33-014	.35
F1	Fuse, "SLO-BLO", 4.0 amps, 250 v	FFG-04-000	.25
T1	Transformer	Add suffix "T" to reg. T1 no.	same as reg. T1
DS1- Res	Res., comp., 120K $\pm 10\%$ 1/2 w	DEB-1241	.12

On following models F1 has different value

MODELS LM-D032, 0-60

F1	Fuse, "SLO-BLO", 1.5 amps, 250 v	FFG-01-500	.25
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MODELS LM-D0-14, LM-234

F1	Fuse, "SLO-BLO", 2.0 amps, 250 v	FFG-02-000	.25
----	-------------------------------------	------------	-----

MODELS LM-235 thru LM 238;
LM-D4P5 thru LM-D8

F1	Fuse, "SLO-BLO", 3.0 amps, 250 v	FFG-03-000	.25
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MODELS LM-D3 thru LM-D4

F1	Fuse, "SLO-BLO", 2.5 amps, 250 v	FFG-02-500	.25
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PARTS FOR "R" OPTION

Variable resistor R1 and transformer T1 change on all "D" package models with suffix "R". Part no. changes for R1 are listed here. For transformer T1 used on these models see standard "D" model parts lists for the standard transformer part no. and add suffix "R" to the part no. Price for T1 does not change.

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
MODELS <u>LM-234</u> , <u>LM-235</u> , <u>LM-D10</u> — <u>LM-D28</u>			
R1	Res., var., ww, 2,200 ohms $\pm 5\%$, 5w	DNS-22-065	\$ 6.25
MODELS <u>LM-236</u> , <u>LM-237</u> , <u>LM-D60</u>			
R1	Res., var., ww, 4,500 ohms $\pm 5\%$, 5w	DNS-45-067	6.25
MODELS <u>LM-238</u> , <u>LM-D100</u> — <u>LM-D150</u> , <u>LM-D-0-32</u>			
R1	Res., var., ww, 9,000 ohms $\pm 5\%$, 5w	DNS-90-068	6.25
MODEL <u>LM-D3</u>			
R1	Res., var., ww, 300 ohms $\pm 5\%$, 5w	DNR-30-029	6.25
MODELS <u>LM-D3P3</u> — <u>LM-D6</u>			
R1	Res., var., ww, 600 ohms $\pm 5\%$, 5w	DNR-60-030	6.25
MODEL <u>LM-D8</u>			
R1	Res., var., ww, 1,000 ohms $\pm 5\%$, 5w	DNS-10-064	6.25
MODELS <u>LM-D36</u> , <u>LM-D48</u> , <u>LM-D-0-14</u>			
R1	Res., var., ww, 3,300 ohms $\pm 5\%$, 5w	DNS-33-066	6.25
MODEL <u>LM-D-0-60</u>			
R1	Res., var., ww, 13,000 ohms $\pm 5\%$, 5w	DNT-13-036	6.25

PARTS FOR "V" OPTION

All "D" Package Models with the "V" option have the same part changes as listed for the "T" option except for transformer T1 listed below

T1	Transformer	Add suffix "V" to reg. T1 no.	same as reg. T1
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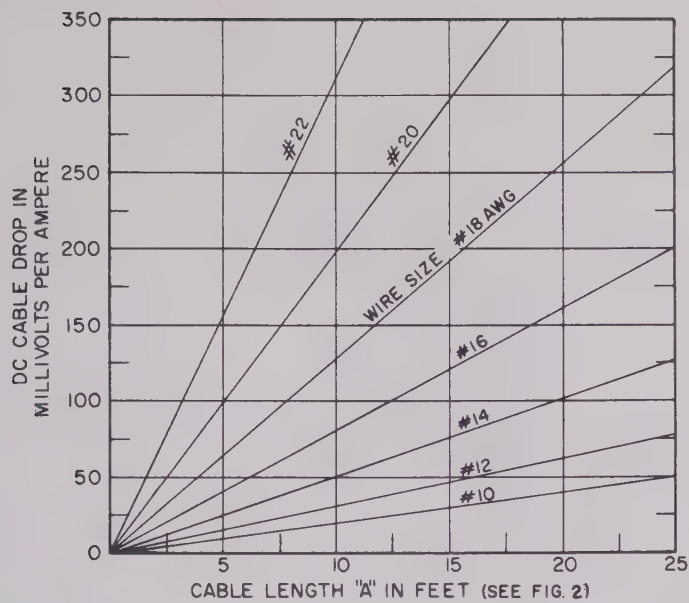


Figure 1. Cable Connection Chart

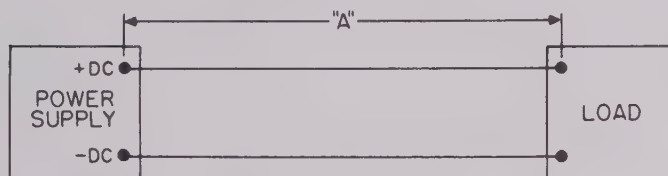
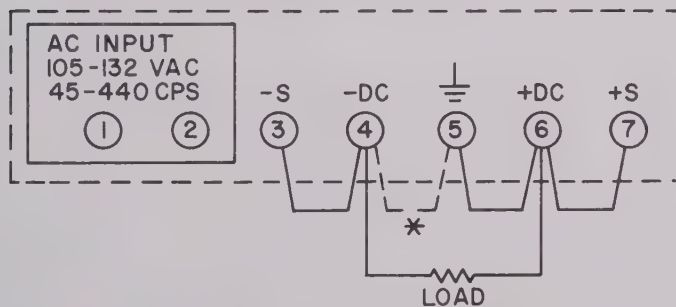


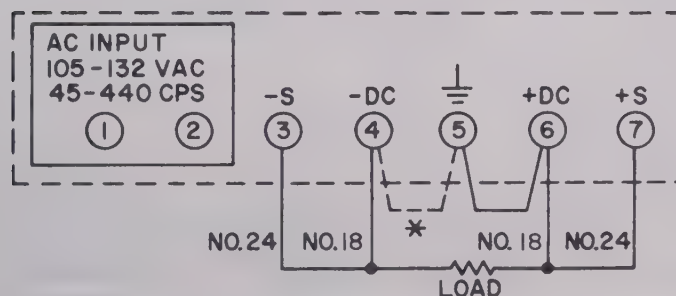
Figure 2. Cable Length "A" in Feet



NOTE:

* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.

Figure 3. Local Sensing Connections



NOTE:

* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.

Figure 4. Remote Sensing Connections

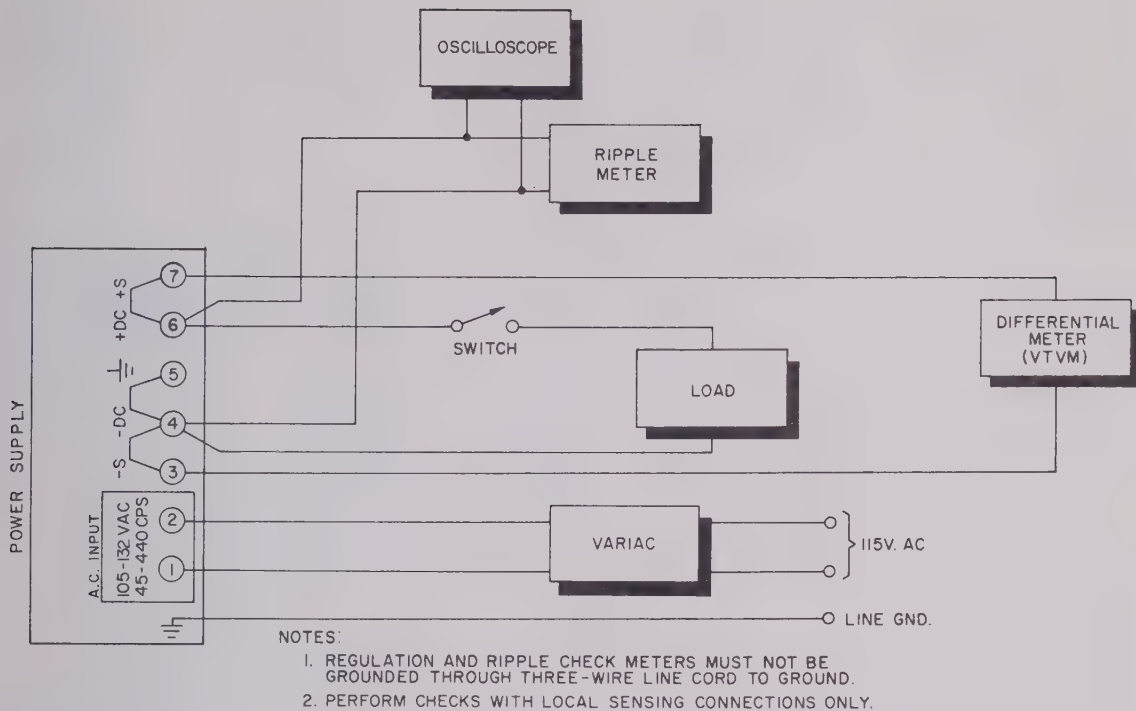


Figure 8. Test Connections for Performance Checks

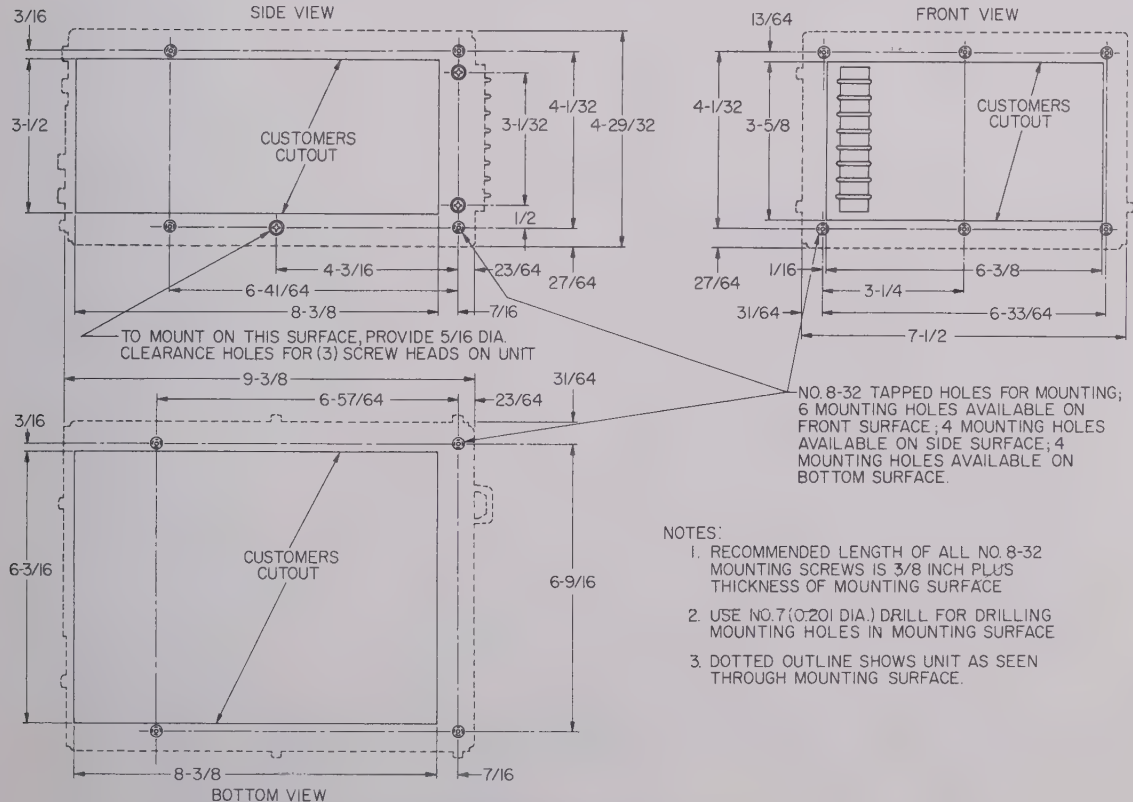
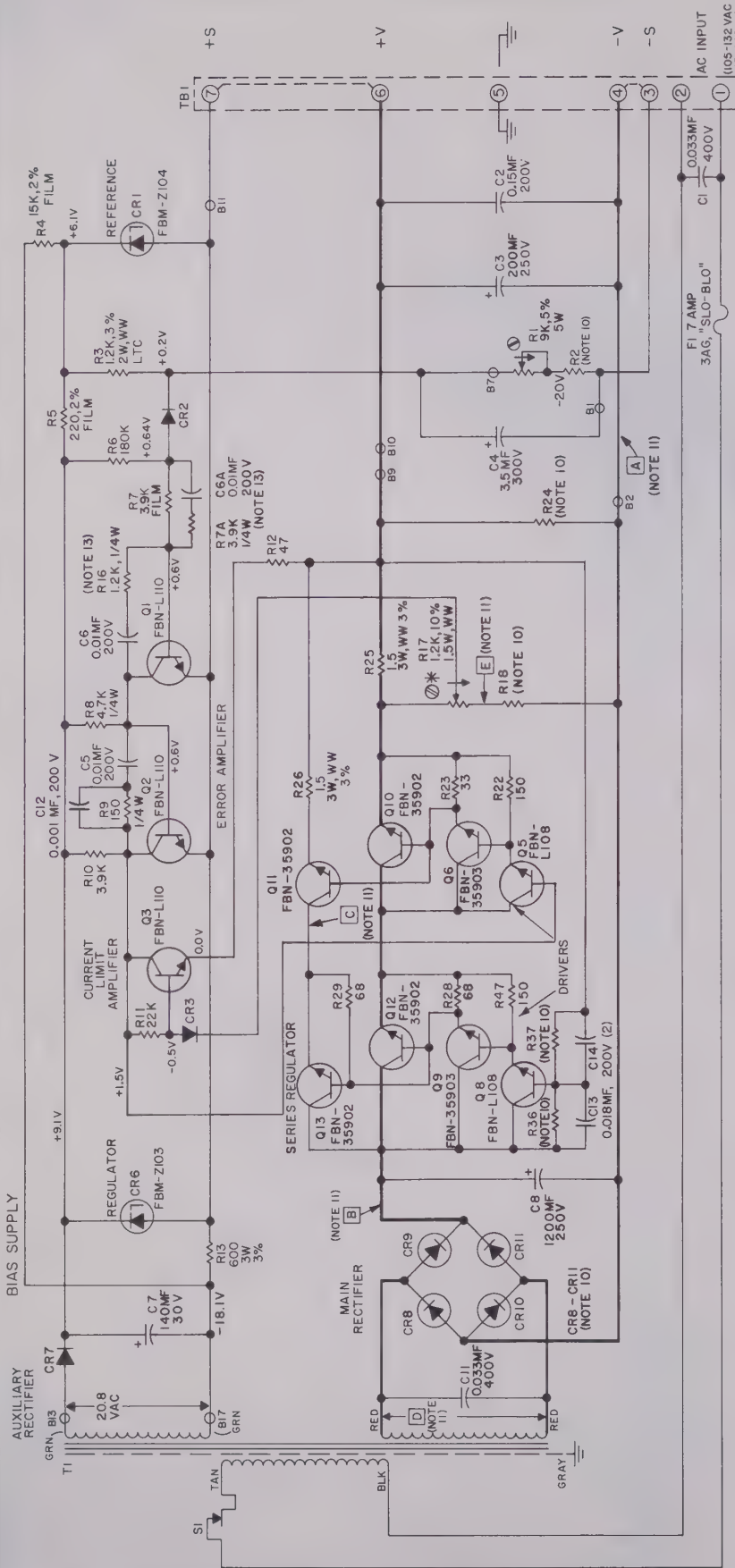


Figure 9. Recommended Mounting Cutouts

TABLE I
DATA REFERENCES FOR MODELS LM-D3 → LM-D6

Model	Voltage Range (VDC)	Max. Current (Amperes)				Schematic Voltage Measurement					Schematic Components					
		40°C	50°C	60°C	71°C	A VDC	B VDC	C VDC	D VAC	E VDC	R1 ±5% 5W	R2 ±3% 3W	R18 ±5% 1/2W	R24 ±10%	R25-30 ±5% 5W	Fuse Rating (Amps.)
LM-D3	3.0±5%	13.1	11.3	9.2	6.2	-3.0	+10.9	-2.0	9.8	-3.0	300	430	Jumper	330 1W	0.22	4.0
LM-D3P3	3.3±5%	13.1	11.3	9.2	6.2	-3.3	+11.9	-2.2	10.7	-3.3	600	430	Jumper	680 2W	0.22	4.0
LM-D3P6	3.6±5%	13.1	11.3	9.2	6.2	-3.6	+11.6	-2.2	10.7	-3.6	600	430	Jumper	680 2W	0.22	4.0
LM-D4	4.0±5%	13.1	11.3	9.2	6.2	-4.0	+11.2	-3.0	10.7	-4.0	600	600	Jumper	680 2W	0.22	4.0
LM-D4P5	4.5±5%	13.1	11.3	9.2	6.2	-4.5	+11.8	-2.8	11.5	-3.4	600	650	390	680 2W	0.39	5.0
LM-D5	5.0±5%	12.6	10.8	9.2	6.1	-5.0	+11.3	-2.8	11.5	-2.4	600	650	1.3K	680 2W	0.39	5.0
LM-D6	6.0±5%	12.4	10.6	8.9	6.0	-6.0	+12.9	-3.8	13.3	-2.9	600	800 2W	1.3K	680 2W	0.39	5.0



8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS:

INPUT: 115VAC, 60 Hz; OUTPUT: NOM'L VDC, NO LOAD

INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE

DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS

TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN

+S (TERM. 7) & INDICATED POINTS UNLESS NOTED.

9. COAT BOTH SIDES OF INSULATING MICA WITH DOW

CORNING NO. 340 SILICONE GREASE.

10. SEE TABLE I FOR COMPONENT VALUES.

11. SEE TABLE I FOR VOLTAGE VALUES.

12. IF Q5 OR Q8 IS REPLACED, ALWAYS

INSTALL RADIATOR AND INSTALL WITH

NEW TRANSISTOR.

13. R16 WAS 1/2 W AND R7A, C6A NOT

USED ON UNITS WITH SERIAL NO.

PREFIXES A-D.

NOTES

1. RESISTOR VALUES ARE IN OHMS.

2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2

WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.

3. RESISTOR TOLERANCES: COMP. $\pm 10\%$; WIREWOUND $\pm 5\%$;

FILM $\pm 5\%$; UNLESS OTHERWISE NOTED.

4. CAPACITOR TOLERANCES: ELECTROLYTIC -10% , $+100\%$;

MYLAR $\pm 10\%$; UNLESS OTHERWISE NOTED.

5. SYMBOLS:

↑ INDICATES COUNTERCLOCKWISE ROTATION OF SHAFT.

⊗ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.

≡ INDICATES CONNECTION TO CHASSIS.

* INDICATES ACTUAL UNIT MARKING.

SEE INSTRUCTION MANUAL.

⚡ LAMBDA PT. #FBL-00-030; USE IN 4002 DIODE

FOR REPLACEMENT UNLESS OTHERWISE NOTED.

⊖ BOARD "B"

⊖ BOARD "B"

DESIGNATIONS ARE LAMBDA PART NUMBERS.

7. DELETE 40°C RATING FOR 45-55 CPS, FOR 360-440

CPS CONSULT FACTORY.

REFERENCE

DESIGNATIONS

NOT USED

Q7 R14

Q8 R15

Q9 R16

Q10 R17

Q11 R18

Q12 R19

Q13 R20

Q14 R21

Q15 R22

Q16 R23

Q17 R24

Q18 R25

Q19 R26

Q20 R27

THIS SCHEMATIC APPLIES TO UNITS

BEARING SERIAL NO. PREFIXES A-E

SCHEMATIC DIAGRAM

REGULATED POWER SUPPLY

FOR WIRING OF POWER SUPPLY

TO LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON

TBI INDICATE JUMPERS IN PLACE

FOR LOCAL SENSING CONNECTION.

LAMBDA ELECTRONICS CORP.
MELVILLE NEW YORK

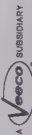
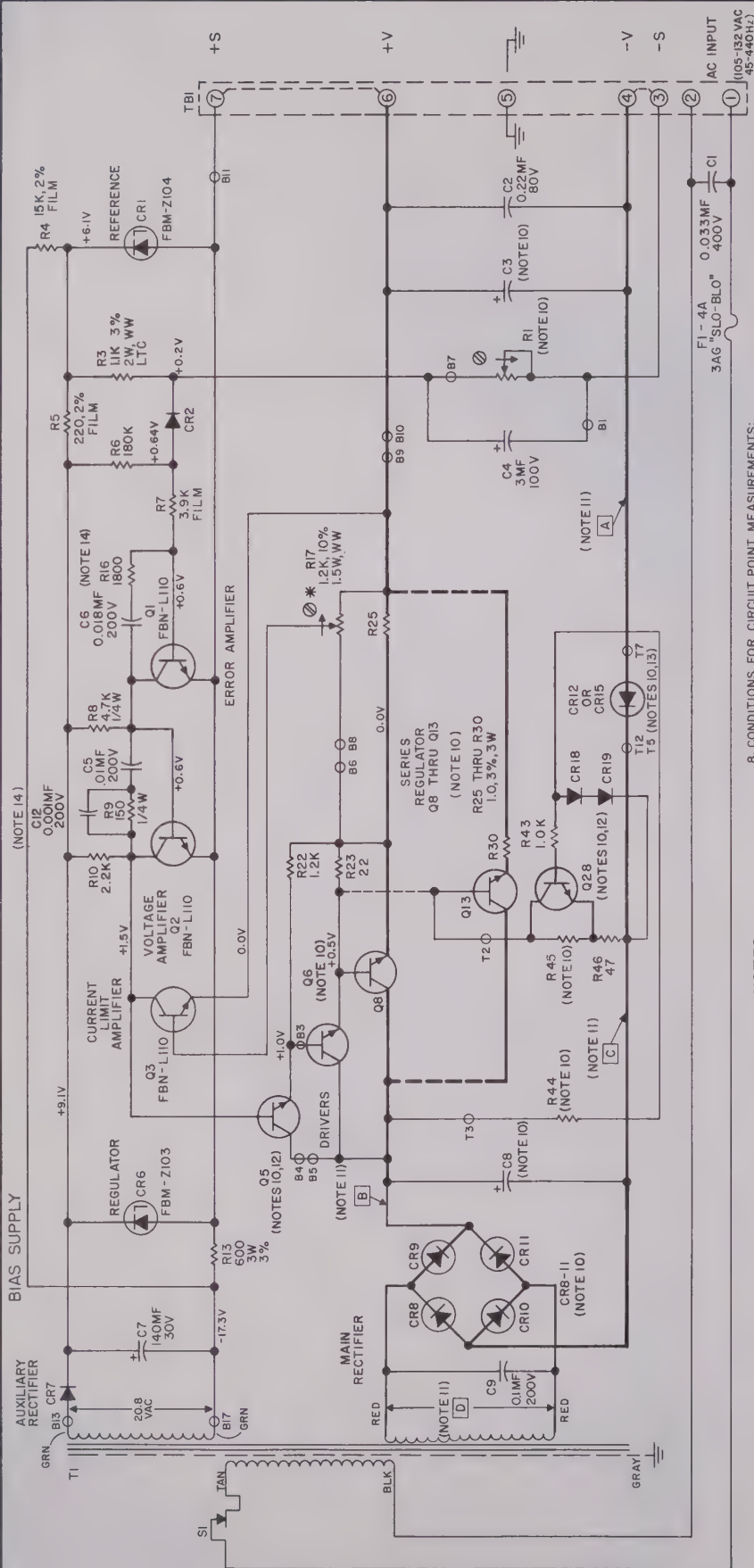


TABLE I
DATA REFERENCES FOR MODELS LM-D100, LM-D120 AND LM-D150

Model	Voltage Range (VDC)	Max. Current (Amperes)				Schematic Voltage Measurement					Schematic Components				
		40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VDC)	E (VDC)	CR8-11 (FBL00-)	R2 ±3%, 5W	R18 ±5%	R24 ±10%, 2W	R36, R37 ±2%, 2W
LM-D100	100±5%	1.7	1.5	1.3	1.1	-100	+56	+26	111	-3.0	065	16K	39K 1/2W	27K	24K
LM-D120	120±5%	1.5	1.3	1.1	1.0	-120	+56	+36	126	-3.1	065	20K	43K 1/2W	27K	24K
LM-D150	150±5%	1.1	1.0	0.90	0.80	-150	+68	+34	155	-3.2	066	26K	56K 1W	47K	33K



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. $\pm 10\%$; WIREWOUND $\pm 5\%$; FILM $\pm 5\%$; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10% $+100\%$; MYLAR $\pm 10\%$; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
 - ↑ INDICATES CLOCKWISE ROTATION OF SHAFT.
 - ⊗ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
 - ⊙ INDICATES CONNECTION TO CHASSIS.
 - INDICATES ACTUAL UNIT MARKING
 - SEE INSTRUCTION MANUAL.
 - LAMBDA PT. #FBL-00-030; USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
 - INDICATES TERMINAL ON PRINTED WIRING BOARD. 'B', BOARD 'T'.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C RATING FOR 45-55 CPS. FOR 360-440 CPS CONSULT FACTORY.

8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS:

- INPUT: 115VAC, 60Hz. OUTPUT: NOM'L VDC, NO LOAD
INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
 10. SEE TABLE I FOR COMPONENT VALUES.
 11. SEE TABLE I FOR VOLTAGE VALUES.
 12. IF Q5 AND/OR Q28 ARE REPLACED, RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
 13. CR15 AND TERMINAL POINT $\odot$ T7 ONLY USED ON MODEL LMD-0-60.
 14. C12 ONLY USED ON MODEL LMD-0-14, AND R16 IS 470 OHMS.

REFERENCE DESIGNATION	NOT USED
Q4	R16, R18
Q7	R21, R24
CR3, 4, 5	R31-42
CR13, 14	R19, 20
Q14-27	CR16, 17
R2, R11	
R12, R14	

FOR WIRING OF POWER SUPPLY TO LOAD, REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS. DOTTED CONNECTIONS SHOWN ON FB INDICATE WAFER PLACEMENT FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-E

SCHEMATIC DIAGRAM REGULATED POWER SUPPLY

MODELS
LMD-0-14
LMD-0-32
LMD-0-60

LAMBDA ELECTRONICS CORP.
MELVILLE NEW YORK
A **Veeco** SUBSIDIARY

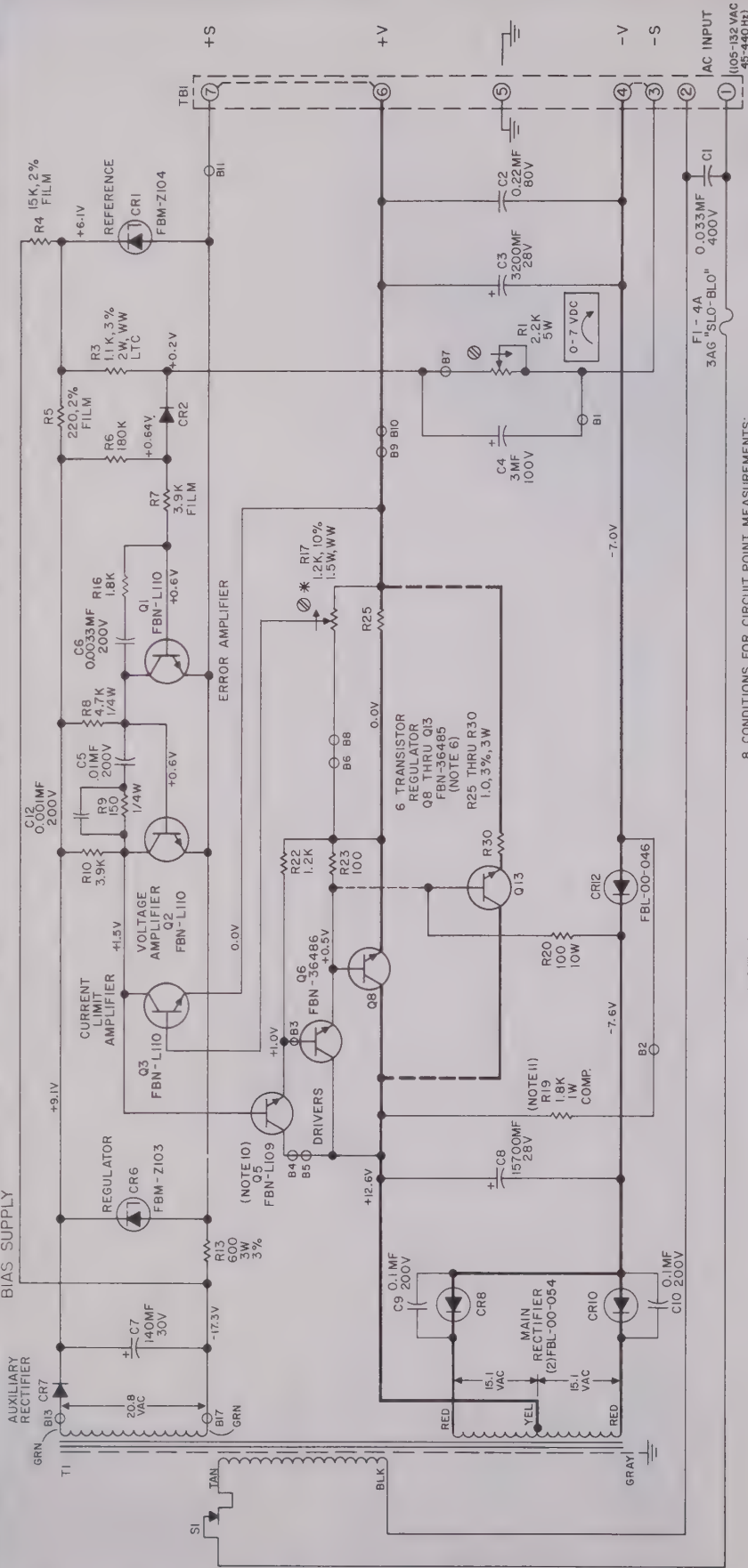
TABLE I

DATA REFERENCES FOR MODELS LMD-0-14
LMD-0-32 AND LMD-0-60

Model	Voltage Range (VDC)	Max. Current (Amps)				Schematic Voltage Measurement				Schematic Components											
						40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VAC)	C3	C8	CR8-11 (FBL-00)	CR12 or CR15* (FBL-00)	Q5 (FBN)	Q6 (FBN)	Q8-13 (FBN)	Q28 (FBN)
LMD-0-14	0-14	4.9	4.2	3.4	2.7	-14.0	+15.5	-14.5	22.3	2100MF, 35V 60V SURGE	9000MF, 45V 60V SURGE	041 or 054	055	L109	36486	36485	L109	3300	2200 10%, 1/2W	820 10%, 1W	1.25
LMD-0-32	0-32	2.5	2.1	1.7	1.3	-32.0	+16.5	-32.5	35.3	1100MF, 60V 100V SURGE	3600MF, 75V 100V SURGE	049 or 054	055	L109	36488	36487	L109	9000	4700 10%, 2W	2000 3%, 3W	3.0
LMD-0-60	0-60	1.3	1.1	0.95	0.75	-60.0	+30.0	-60.5	64.6	400MV, 100V 150V SURGE	3100MF, 110V 150V SURGE	049 or 054	065	L108	35903	35902	L108	13000	4500 3%, 3W	4500 3%, 3W	6.0

*CR15 only used on Model LMD-0-60

BIAS SUPPLY



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. $\pm 10\%$; WIREWOUND $\pm 5\%$; FILM $\pm 5\%$; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10% $+100\%$; MYLAR $\pm 10\%$; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
 - ↑ INDICATES CLOCKWISE ROTATION OF SHAFT.
 - ⊗ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
 - ⊙ INDICATES CONNECTION TO CHASSIS.
 - INDICATES ACTUAL UNIT MARKING
 - * SEE INSTRUCTION MANUAL.
 - ➔ LAMBDA PT. #FBL-00-030; USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
 - ⊖ INDICATES TERMINAL ON PRINTED WIRING BOARD 'B'.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C RATING FOR 45-55 CPS; FOR 360-440 CPS CONSULT FACTORY.

8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS:

- INPUT: 115VAC, 60 Hz ; OUTPUT: 7 VDC, NO LOAD
 INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLT-METER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
 9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
 10. IF Q5 IS REPLACED, ALWAYS RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
 11. R19 ONLY USED IN MODEL LM234 UNITS WITH SERIAL NO. PREFIXES A-C.

REFERENCE DESIGNATIONS NOT USED
Q4
Q7
CR3,4,5
CR9
CR11
R2, R11
R12, R14

FOR WIRING OF POWER SUPPLY TO BEARING ASSEMBLY, SEE LAMBDA WIRING DIAGRAMS. DOTTED CONNECTIONS SHOWN ON TBI INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-E

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

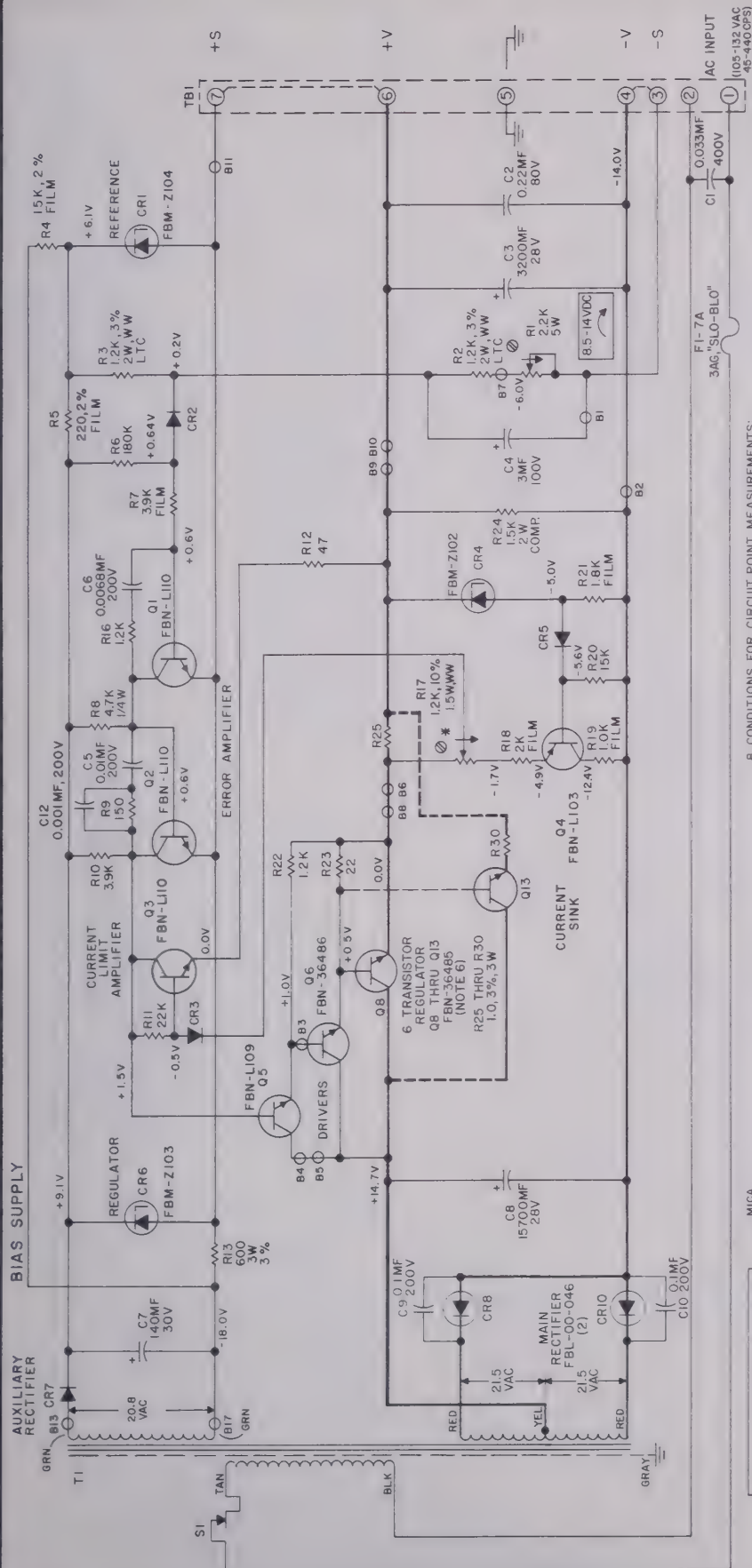
MODEL LM234, 0 - 7 VDC

RATING TABLE	
AMB. TEMP	MAX. LOAD
40°C	8.3A
50°C	7.3A
60°C	6.5A
71°C	5.5A

(SEE NOTE 7)



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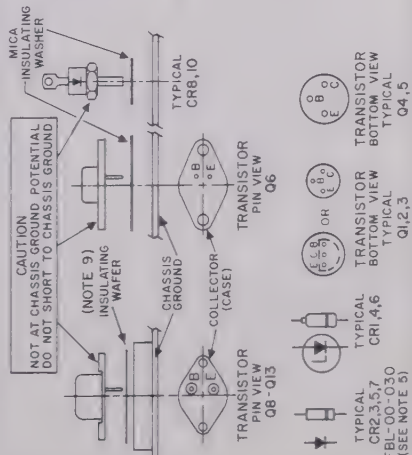


8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS:

- INPUT: 115VAC, 60CPS; OUTPUT: 14 VDC, NO LOAD.
- INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.

NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. $\pm 10\%$; WIREWOUND $\pm 5\%$; FILM $\pm 5\%$; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC $\pm 10\%$, $\pm 100\%$; MYLAR $\pm 10\%$; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
 - ⬆ INDICATES CLOCKWISE ROTATION OF SHAFT.
 - ⬆ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
 - ⬆ INDICATES CONNECTION TO CHASSIS.
 - ⬆ INDICATES ACTUAL UNIT MARKING.
 - ⬆ SEE INSTRUCTION MANUAL.
 - ⬆ LAMBDA PT. #FBL-00-030; USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
 - ⬆ INDICATES TERMINAL ON PRINTED WIRING BOARD "B".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C RATING FOR 45-55 CPS, FOR 360-440 CPS CONSULT FACTORY



FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-10-LOAD WIRING DIAGRAMS. DOTTED CONNECTIONS SHOWN ON TBI INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-E

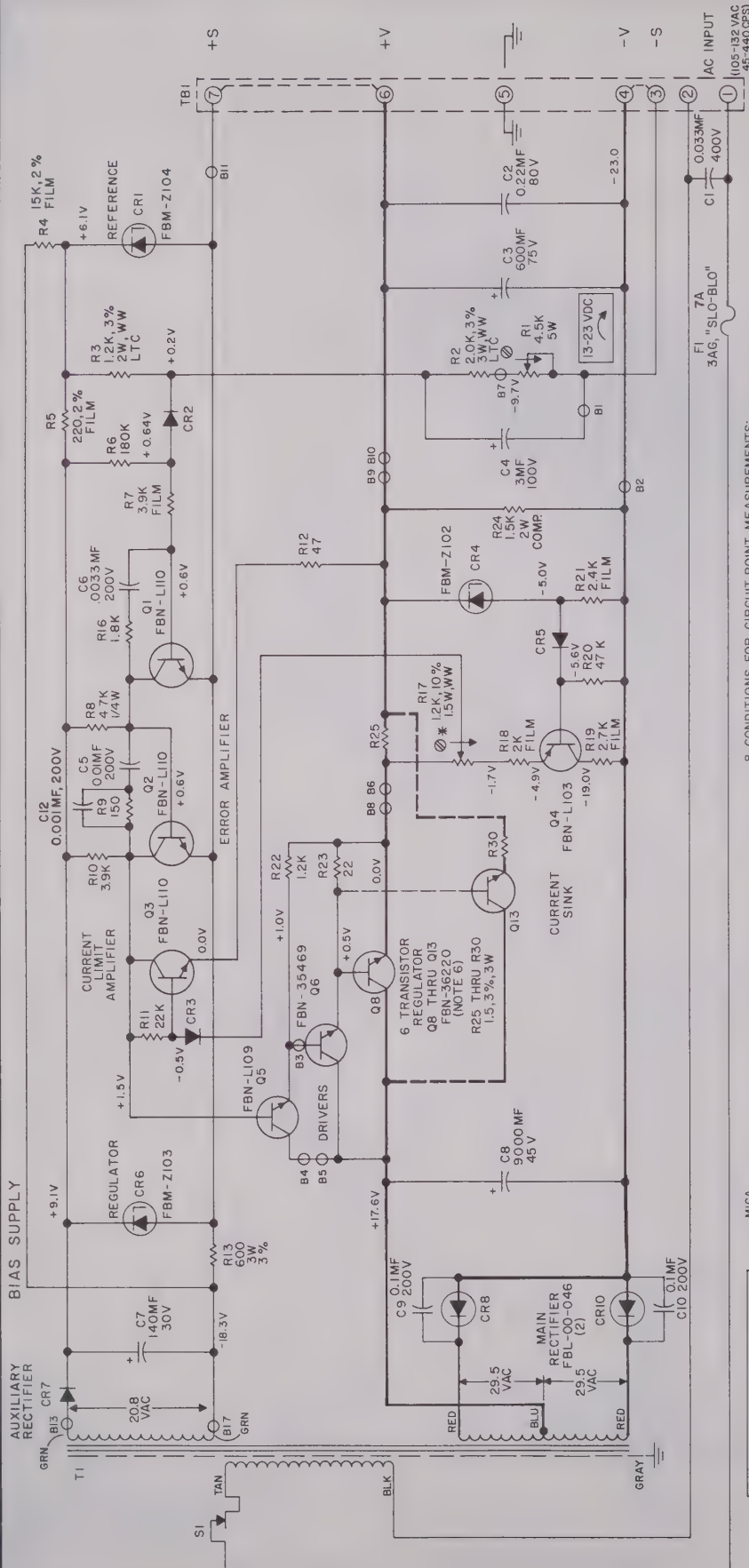
SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY
MODEL LM235, 8.5-14 VDC

RATING TABLE

AMB. TEMP.	MAX. LOAD
40°C	7.7A
50°C	6.8A
60°C	6.0A
71°C	4.8A

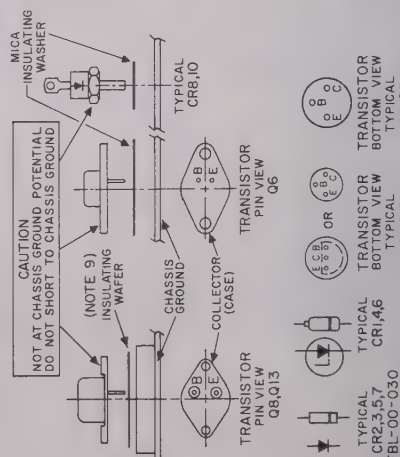
(SEE NOTE 7)

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NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. $\pm 10\%$; WIREWOUND $\pm 5\%$; FILM $\pm 5\%$; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC $\pm 10\%$ $\pm 100\%$; MYLAR $\pm 10\%$; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
 - ⬆ INDICATES CLOCKWISE ROTATION OF SHAFT.
 - ⬆ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
 - ⬆ INDICATES CONNECTION TO CHASSIS.
 - ⬆ INDICATES ACTUAL UNIT MARKING.
 - ⬆ SEE INSTRUCTION MANUAL.
 - ⬆ FOR REPLACEMENT UNLESS OTHERWISE NOTED.
 - ⬆ BOARD "B".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C RATING FOR 45-55 CPS; FOR 360-440 CPS CONSULT FACTORY.



REFERENCE DESIGNATIONS NOT USED	REFERENCE DESIGNATIONS NOT USED
Q7	R14
R15	CR9

8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS:
INPUT: 115 VAC, 60 CPS; OUTPUT: 23 VDC, NO LOAD.
INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. -COT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.

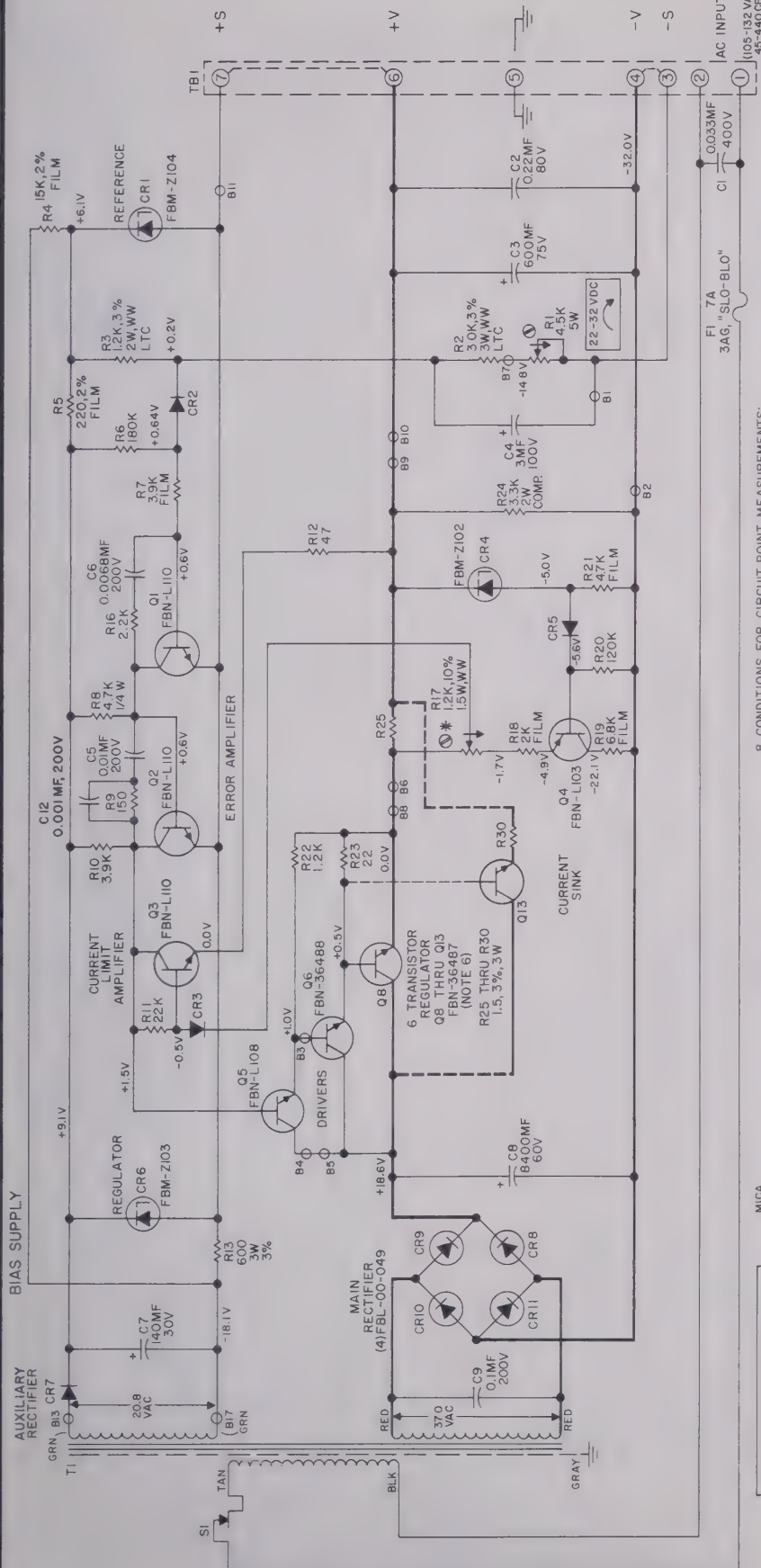
THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-E

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY
MODEL LM236, 13-23VDC

RATING TABLE	
AMB. TEMP.	MAX. LOAD
40°C	5.8A
50°C	5.1A
60°C	4.5A
71°C	3.6A

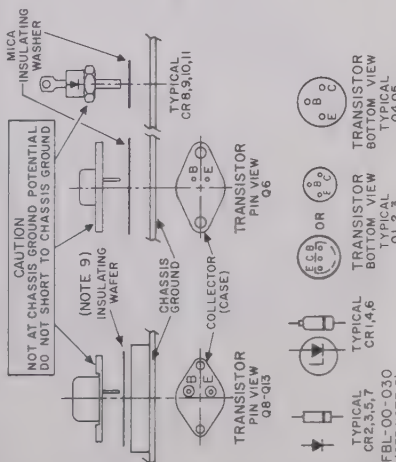
(SEE NOTE 7)

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NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. $\pm 10\%$; WIREWOUND $\pm 5\%$; FILM $\pm 5\%$; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10% , $+100\%$; MYLAR $\pm 10\%$; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
 - ⬇ INDICATES CLOCKWISE ROTATION OF SHAFT.
 - ⬆ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
 - INDICATES CONNECTION TO CHASSIS.
 - * INDICATES ACTUAL UNIT MARKING
 - SEE INSTRUCTION MANUAL
 - LAMBDA PART #FBL-00-030; USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
 - ⊖ INDICATES TERMINAL ON PRINTED WIRING BOARD "B"
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C RATING FOR 45-55 CPS, FOR 360-440 CPS CONSULT FACTORY



8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS:
INPUT: 115 VAC, 60 CPS; OUTPUT: 32 VDC, NO LOAD
INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE NOT USED
DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.

REFERENCE DESIGNATIONS NOT USED
Q7
R14
R15

RATING TABLE
AMB. TEMP.
MAX. LOAD
40°C 5.0A
50°C 4.4A
60°C 3.9A
71°C 3.1A

(SEE NOTE 7)

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY TO-LOAD WIRING DIAGRAMS. DOTTED CONNECTIONS SHOWN ON TBI INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-E

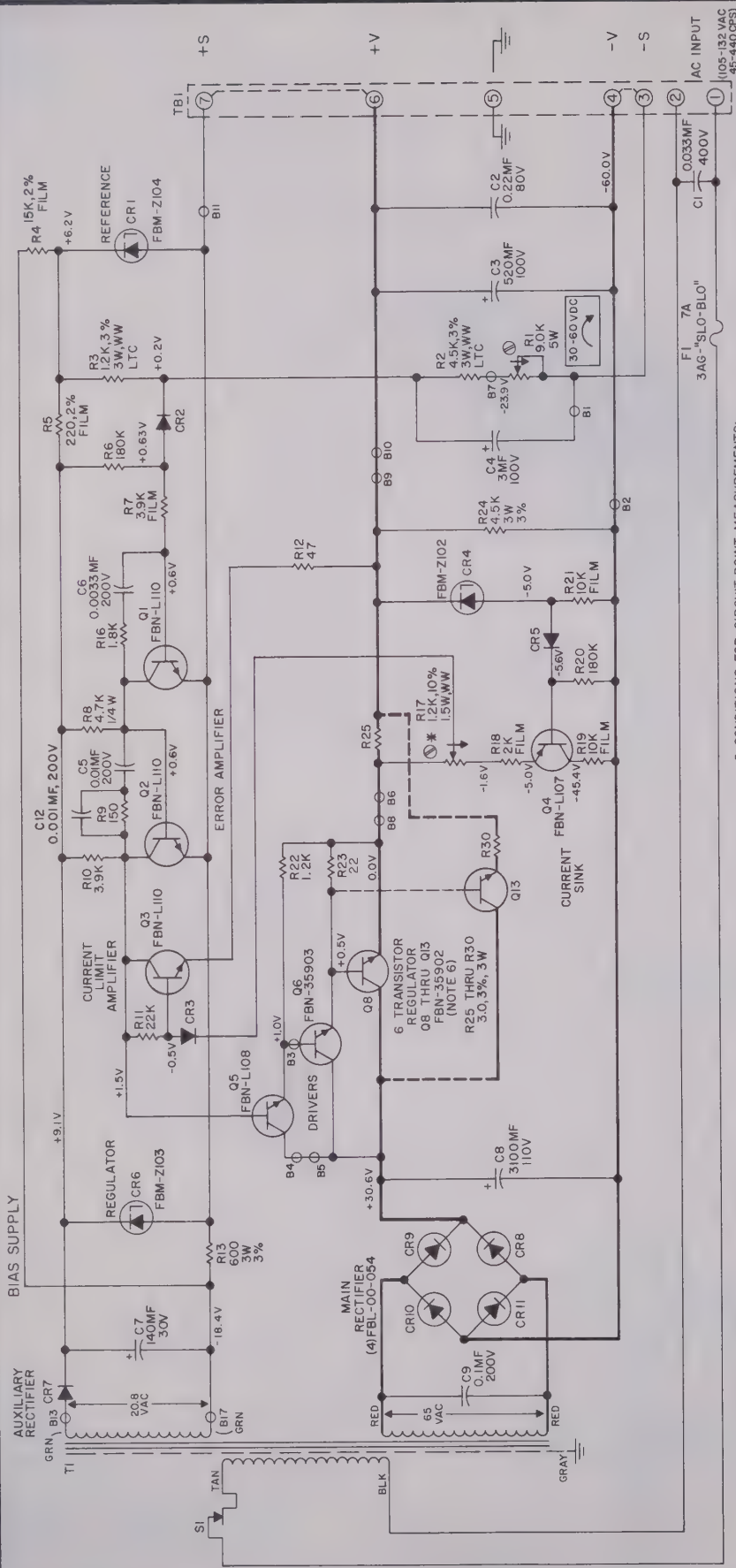
SCHEMATIC DIAGRAM

REGULATED POWER SUPPLY

MODEL LM 237, 22-32VDC



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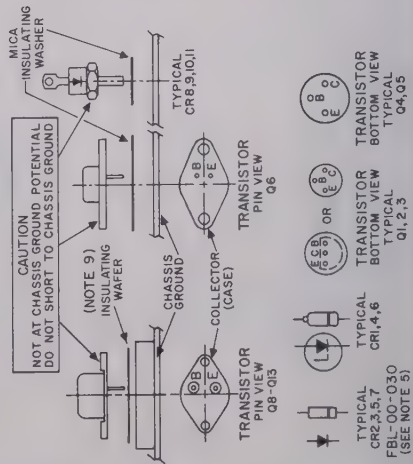


8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS:

- INPUT: 115 VAC, 60 CPS; OUTPUT: 60 VDC, NO LOAD
- INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE NOT USED
- DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
- CAPACITOR TOLERANCES: ELECTROLYTIC -10%+100%; MYLAR $\pm 10\%$; UNLESS OTHERWISE NOTED.
- SYMBOLS:
 - INDICATES COUNTER-ROTATION OF SHAFT.
 - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
 - INDICATES CONNECTION TO CHASSIS.
 - INDICATES ACTUAL UNIT MARKING.
 - SEE INSTRUCTION MANUAL.
 - FOR REPLACEMENT UNLESS OTHERWISE NOTED.
 - INDICATES TERMINAL ON PRINTED WIRING BOARD. 'B'.
- DESIGNATIONS ARE LAMBDA PART NUMBERS.
- DELETE 40°C RATING FOR 45-55 CPS, FOR 360-440 CPS CONSULT FACTORY.

NOTES

- RESISTOR VALUES ARE IN OHMS.
- RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
- RESISTOR TOLERANCES: COMP. $\pm 10\%$; WIREWOUND $\pm 5\%$; FILM $\pm 5\%$; UNLESS OTHERWISE NOTED.
- CAPACITOR TOLERANCES: ELECTROLYTIC -10%+100%; MYLAR $\pm 10\%$; UNLESS OTHERWISE NOTED.
- SYMBOLS:
 - INDICATES COUNTER-ROTATION OF SHAFT.
 - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
 - INDICATES CONNECTION TO CHASSIS.
 - INDICATES ACTUAL UNIT MARKING.
 - SEE INSTRUCTION MANUAL.
 - FOR REPLACEMENT UNLESS OTHERWISE NOTED.
 - INDICATES TERMINAL ON PRINTED WIRING BOARD. 'B'.
- DESIGNATIONS ARE LAMBDA PART NUMBERS.
- DELETE 40°C RATING FOR 45-55 CPS, FOR 360-440 CPS CONSULT FACTORY.



REFERENCE DESIGNATIONS	NOT USED
Q7	
R14	
R15	

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-E

SCHEMATIC DIAGRAM REGULATED POWER SUPPLY MODEL LM 238, 30-60VDC

RATING TABLE	
AMB. TEMP.	MAX. LOAD
40°C	2.6A
50°C	2.3A
60°C	2.0A
71°C	1.6A

(SEE NOTE 7)



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FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS. DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.



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We warrant each instrument manufactured by us, and sold by us or our authorized agents, to be free from defects in material and workmanship, and that it will perform within applicable specifications for a period of five years after original shipment. Our obligation under this guarantee is limited to repairing or replacing any instrument or part thereof, (except tubes and fuses) which shall, within five years after delivery to the original purchaser, be returned to us with transportation charges prepaid, prove after our examination to be thus defective.

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